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Skeptical Inquirer

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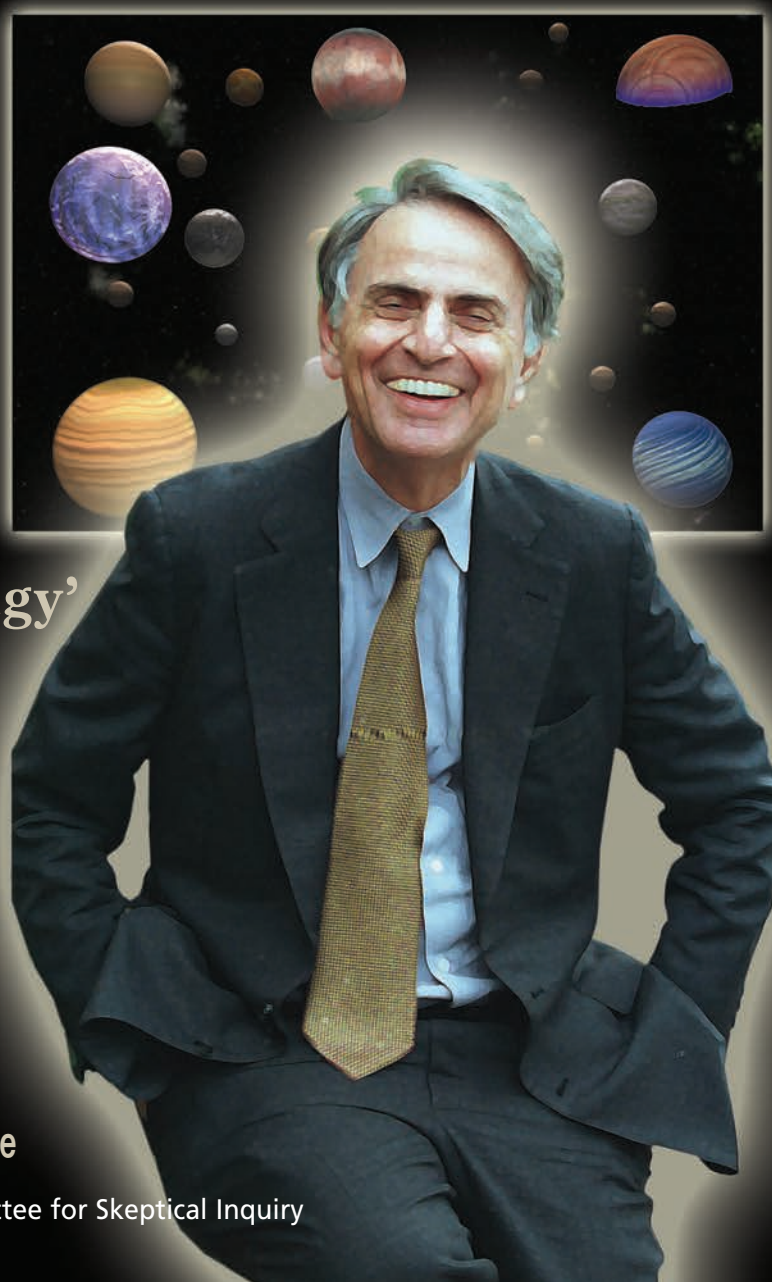

New Directions for Skeptical Inquiry

ID's 'Vise Strategy' Undone

Strange Visions

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Energy Pseudo-science

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January / February 2007 • VOL. 31, NO. 1

EDITORIAL

5 **It's CSI Now, Not CSICOP**
KENDRICK FRAZIER AND THE EXECUTIVE COUNCIL

7 **New Directions for Skeptical Inquiry**
PAUL KURTZ

ARTICLES

29 **Man for the Cosmos: Carl Sagan's Life and Legacy as Scientist, Teacher, and Skeptic**
DAVID MORRISON

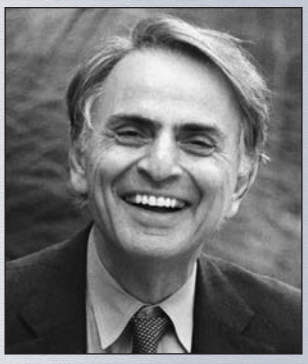
37 **Do They Have Your Numb3r?**
KENDRICK FRAZIER

40 **The 'Vise Strategy' Undone**
Kitzmiller et al. v. Dover Area School District
BARBARA FORREST

47 **Strange Visions**
Haloes, Dust Storms, and Blood on the Walls
A. CHARLES CATANIA

51 **Pep Talk**
How to Get Rid of the Energy You Don't Need
WILLIAM H. BAARSCHERS

55 **Mass Hysteria at Starpoint High**
ROBERT E. BARTHOLOMEW AND BENJAMIN RADFORD



Cover: Carl Sagan ©1994 by Michael Okoniewski

SPECIAL REPORTS

12 **World Trade Center Illness: Manufactured Mass Hysteria**
MICHAEL FUMENTO

13 **New Report Casts Doubt on Gulf War Syndrome**
BENJAMIN RADFORD

COMMENT AND OPINION

15 **The Art of Persuasion in Politics (and Science)**
BENJAMIN WOLOZIN

COLUMNS

EDITOR'S NOTE
Men of the Cosmos 4

NEWS AND COMMENT
Energy Department Will End Most Polygraph Testing / Moscow Round Table Discusses False Science in Russia / Pluto/Planet Roundtable Now Online / UCS Releases Science Idol Calendar / Michigan Supports Evolution, Rejects ID for Science Classes . . 8

NOTES OF A FRINGE WATCHER
'Dr.' Bearden's Vacuum Energy
MARTIN GARDNER 18

INVESTIGATIVE FILES
Mysterious Entities of the Pacific Northwest, Part I
JOE NICKELL 20

THINKING ABOUT SCIENCE
Evolutionary Epistemology, Anyone?
MASSIMO PIGLIUCCI 23

NOTES ON A STRANGE WORLD
The Devious Art of Improvising, Lesson Two
MASSIMO POLIDORO 24

PSYCHIC VIBRATIONS
The Flashlight of the Gods
ROBERT SHEAFFER 26

SKEPTICAL INQUIREE
Soul Scales
BENJAMIN RADFORD 28

NEW BOOKS 61

FORUM
Bigfoot, Pluto, and ?
CHRIS VOLKAY 63

LETTERS TO THE EDITOR 65

BOOK REVIEW

Intelligent Thought: Science versus the Intelligent Design Movement
Edited by John Brockman
MATT YOUNG 59

Editor's Note

Men of the Cosmos

It seems entirely fitting that our cover article in appreciation of Carl Sagan, marking the tenth anniversary of his death, is written by David Morrison.

Morrison, in many respects, follows in Sagan's footsteps. Sagan was David's thesis advisor at Harvard, where Morrison got his PhD in astronomy. As was Sagan, Morrison is a leading planetary scientist. He is the Senior Scientist at the NASA Astrobiology Institute, where he participates in research programs in the study of life in the universe. There he follows Sagan's example of interest in life on other worlds and in bridging biological and astronomical sciences. He also leads programs studying and tracking near-Earth objects, asteroids in orbits that intersect Earth's. Before his current position he was Chief of the Space Science Division and Director of Space at the NASA Ames Research Center. And before that he was a professor of astronomy at the University of Hawaii and the university's vice-chancellor for research.

Like Sagan, he's devoted a fair amount of his career to communicating. He has published twelve books. I have four on my shelves, *Voyage to Jupiter, Voyages to Saturn* (both NASA books), and two astronomy textbooks, *Abell's Exploration of the Universe*, seventh edition, and *Voyages Through the Universe*, both by Morrison, Sydney Wolff, and Andrew Fraknoi. The latter two are successors to the highly popular textbook of the late George O. Abell (a beloved member of the SI Editorial Board until his death in 1983). That tradition continues in regularly updated editions of *Voyages Through the Universe.* Other Morrison titles include the first modern planetary science text, *The Planetary System* (with Tobias Owen, now in its third edition), and *Exploring Planetary Worlds* (Scientific American Library).

As did Sagan, Morrison works to counter pseudoscience and fringe-science and to help the public distinguish between real science and its pretenders. A longtime CSICOP Fellow, he has been a regular contributor to the SKEPTICAL INQUIRER over the years. Recent examples include his "Astrobiology Is the New Modern Framework for SETI" (May/June 2006), "Only a Theory? Framing the Evolution/Creation Issue" (November/December 2005), and "Hyperbole in Media Reports on Asteroids and Impacts" (March/April 2005). "Facts and Fantasies of Extraterrestrial Life" (March/April 2000) was his review of Joel Achenbach's book *Captured by Aliens*. His first SI cover article (with Clark Chapman) was "The New Catastrophism: Earth, Life, and Impacts" (Winter 1990). And he championed the SI publication of one of the most provocative and controversial articles ever to appear in the SKEPTICAL INQUIRER, "A Skeptical Look at September 11th" by Clark Chapman and Alan W. Harris (SI, September/October 2002), which Richard Dawkins selected for inclusion in *The Best American Science and Nature Writing 2003* (Houghton Mifflin).

I've merely touched on David Morrison's work, but you can begin to see why the American Astronomical Society recently honored him with its Carl Sagan Medal for his contributions to the public understanding of science.

We can be grateful for the contributions to public understanding by both these planetary scientists, both distinguished citizens of the cosmos.

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It's CSI Now, Not CSICOP

KENDRICK FRAZIER
AND THE EXECUTIVE COUNCIL

CSICOP's name has been shortened. The Executive Council of the Committee for the Scientific Investigation of Claims of the Paranormal (CSICOP) has formally adopted a shorter name for the organization: Committee for Skeptical Inquiry (CSI).

The decision came in a daylong meeting of the Executive Council (which also serves as SI's Editorial Board) in Oak Brook, Illinois, on September 23, 2006. It will become official as soon as the appropriate legal papers have been filed and processed.

CSICOP and our flagship publication the SKEPTICAL INQUIRER celebrated thirtieth anniversaries in 2006 (see SI March/April 2006, p. 13; July/August 2006, pp. 13–14; September/October 2006, pp. 13–19).

During those three decades, the name has been both a help and a hindrance. The "CSICOP" acronym is widely known and has served the organization well, but the full name of the committee has always been somewhat problematic.

Because so many of you have been with us a long time and feel a deep attachment to the organization, for which we are grateful, we thought we would discuss with you some of the rationale for the name change.

The first and less substantive concern has been the name's length. A shorter, more succinct name has long been desired by many of us within CSICOP (now CSI). Almost nobody can remember our full, ten-word name properly. It takes a long time even to say it. In this modern media age, brevity is important. Newspapers and most magazines are obligated by style and usage to publish the full name of any organization they write about, but they obviously prefer shorter names; radio and TV can't and won't use a long name for an organization. CSICOP staff and associated scholars and investigators who do media interviews often have resorted to a variety of shortcut references to get any mention of the organization at all included. These same concerns come up repeatedly in discussions with people not already familiar with us about who we are and what we do.

The more substantive concern involved the last word in our name, "paranormal." For one thing, we have never been limited to just the "paranormal." From the beginning we have been concerned with all manner of empirical claims credulously accepted without sufficient critical examination. Our goal has been to provide scientific examinations of these claims, so that reliable, fact-based, verified information can be

used in making judgments about them. We have used terms such as "pseudoscientific" and "fringe-science" or even "paranatural" as adjectives to portray that larger realm. But even those terms, broad as they may seem, are limiting.

Our broader, overarching purpose is to encourage critical inquiry, scientific thinking, and the scientific outlook. In short, to promote science and reason. More and more we are concerned with science-related issues that have broad public-policy importance, especially where the science is being misrepresented or misused or ignored. Our original core focus on the "paranormal" was partly because that was where a lot of misinformation and intentional disinformation existed. Also, paranormal topics had broad appeal to the public and the media, and the scientific community was basically ignoring them, allowing promoters of the paranormal to go unchallenged. To a certain extent all that is still true. Nevertheless, our underlying interest has never been the paranormal per se, but larger topics and issues such as how our beliefs in such things arise, how our minds work to deceive us, how we think, how our critical thinking capabilities can be improved, what *are* the answers to certain uninvestigated mysteries, what damage is caused by uncritical acceptance of untested claims, how critical attitudes and scientific thinking can be better taught, how good science can be encouraged and bad science exposed, and so on and on.

CSI's mission to promote the application of rational thought to public discourse has always attracted world-class scientists and scholars to this endeavor. But many of them (or at least their colleagues) feel that the word "paranormal" in the name of CSICOP makes the scope of the committee appear narrower than it actually is. It always required an explanation that we weren't the promoters of the paranormal but the scientific investigators, the critical evaluators. Finally, many academics and others just didn't want to be associated at all with anything with the *paranormal* in its name, no matter the context. Many of us understood, and some even shared the feeling. As we look to the future, CSI seeks to expand its reach, and the Executive Council felt that focusing CSI on skepticism rather than the paranormal would convey the interests of CSI more broadly.

In 1996 the Executive Council formed a subcommittee to consider a possible name change. The subcommittee did so, but in the end decided not to recommend a change. But this time the Executive Council, after an extended discussion, decided on a change.

The decision to shorten the name came first and was easiest. Deciding on the actual name proved more complicated. One goal was to shorten the name but maintain key words. Another was, ideally, to keep the same first initials. All permutations of many possible names were discussed, but the choice finally came down to three: Committee for Skeptical Inquiry, Committee for Scientific Investigation, and Committee for Scientific Inquiry. "Committee for Scientific Investigation" had the advantage of maintaining intact the first four words of our name, but some felt it was overly broad, even a little presumptuous. ". . . Scientific Inquiry" was also seriously considered. But in the end, "Committee for Skeptical Inquiry" was chosen, in large part because it was the most specific and it includes the root words of our magazine's title, the SKEPTICAL INQUIRER. (The Executive Council members, by the way, felt our magazine's name works well and should not be tinkered with. Our subtitle, The Magazine for Science and Reason, was also praised.)

(Another side note: "Council," "Commission," "Association" and other such words were considered for the first word of the name but rejected for a variety of reasons, including the fact that we are often referred to or thought of as "the Committee.")

CSICOP is to many of us a beloved name (or acronym), and we expect many of us will continue to use it for some time while transitioning in our own minds to CSI. The new abbreviation, by the way, is pronounced C-S-I (not "psi"!). And yes, we know there is a popular science-oriented television program (actually three of them) with CSI in the title but thought, frankly, that that was as much an advantage for us as a disadvantage.

* * *

These same discussions led the Executive Council, at the same meeting, also to make several changes to the organization's mission statement, which appears in short form on the back cover of every issue of SI. The more general, overarching statement of our mission was placed first: ". . . promotes science and scientific inquiry, critical thinking, science education, and the use of reason in examining important issues." The reference to "investigation of paranormal and fringe-science claims" from a responsible point of view was replaced with "investigation of controversial or extraordinary claims." This thus ratifies the broader mission we have already long been pursuing. In fact, the Executive Council encouraged CSI and the SKEPTICAL INQUIRER to continue to widen their purview to new science-related issues at the intersection of science and public concerns, while not ignoring our core topics.

Implicit in all this is that, as before, we provide quality, informed scientific analysis and deal preferentially, if not always exclusively, with empirical, testable, fact-based claims, not assertions based mostly on opinion or ideology.

—Kendrick Frazier (Member, Executive Council, and editor, SKEPTICAL INQUIRER), for all members of the Executive Council: James E. Alcock, Barry Beyerstein, Thomas Casten, Kendrick Frazier, Ray Hyman, Paul Kurtz, Lee Nisbet, Amardeo Sarma, and Benjamin Wolozin [newly elected]; Barry Karr, ex officio*)*

New Directions for Skeptical Inquiry

PAUL KURTZ

Professor Emeritus of Philosophy, University at Buffalo; Chairman, CSI

The Committee for the Scientific Investigation of Claims of the Paranormal (CSICOP) has reached an historic juncture: the recognition that there is a critical need to change our direction. Under the new name, the Committee for Skeptical Inquiry (CSI) will not confine itself primarily to the scientific investigation of claims of the paranormal—we never have—but will deal with a wider range of questionable claims that have emerged in the contemporary world. Actually, the subtitle of SKEPTICAL INQUIRER—The Magazine for Science and Reason—is the best description of our overall mission: to explicate and defend the importance of scientific inquiry, thus contributing to the public understanding of science.

When we founded CSICOP in 1976, we were concerned with the proliferation of paranormal claims in the media that were unexamined by scientific investigators. These were often on the borderlines of science. When we announced our intention of creating CSICOP, many scientists heralded the role that we were to play. At long last an organization composed of scientists, educators, investigators, and journalists proposed to carefully investigate alleged mysterious phenomena, which were not being adequately examined by the scientific community.

These questions were generally interdisciplinary; they fell between the cracks of existing disciplines. Distinguished scientists rallied under our banner from the start—including Carl Sagan, Steven Jay Gould, Isaac Asimov, Richard Dawkins, and Nobel Prize winners Murray Gell-Mann, Francis Crick, Glenn Seaborg, Leon Lederman, and others. We also enlisted well-known investigators of the paranormal, such as James Randi, Philip J. Klass, Martin Gardner, Ray Hyman, and others. Scientists worldwide embraced our agenda such as astronomer Cornelius de Jaeger (The Netherlands), Jean-Claude Pecker (France), and Nobel laureate scientists in Italy. We were interested in criticizing the distortions in the media of alleged phenomena, from psychics and UFOlogists to astrologers and faith healers. These posed, in our view, a threat to the integrity of science, for they fudged the differences between genuine science and pseudoscience. We soon discovered that it was often difficult to draw a sharp demarcation line between these two areas; empirical inquiry was the only sensible approach. We were ever careful not to squelch new proto-sciences that might emerge. After thirty years we have established a record in which naturalistic causal explanations for such alleged phenomena are now available. The "paranormal" has been deflated in field after field.

We of course had a broader motive: to explicate the methods of scientific methodology and the scientific outlook, to encourage scientific education, and the development of critical thinking. We viewed ourselves as the defenders of the Enlightenment.

Today there are new challenges to science. For example, the field of biogenetic engineering provides exciting opportunities for the growth of knowledge and its applications to human betterment. Yet powerful moral, theological, and political forces have opposed scientific research on a whole number of issues—such as stem-cell embryonic research. On the other hand, pro-scientific proponents say that we are faced with "a New Singularity," and that life-extension programs of research offer great promises for extending life. Science demands rigorous peer review. The excessive extrapolation of possible breakthroughs needs careful evaluation. Thus skeptical inquiry needs to examine such claims impartially. There are still other challenges that will no doubt emerge.

Under its new title, the Committee for Skeptical Inquiry will endeavor to be true to its early mission. We intend to invite leading scientific investigators from a variety of fields to carefully evaluate questionable claims and will criticize those who would block science in the name of occult force—such as the imposition of the concept of "soul" to thwart the investigation of the brain. As such, CSI will function as a Socratic gadfly, using the best tools of scientific inquiry and analysis to ferret out what is at stake. Hopefully it can contribute to the public appreciation of science and also distinguish pseudoscientific claims from genuine ones. We have not abandoned the examination of paranormal claims, but we have extended our net more widely to deal with other areas that have provoked controversy.

The Executive Council of CSICOP embarks in this new direction with great enthusiasm. The "new skepticism" that we have cultivated recognizes that *skepticism* is an important part of the process of scientific inquiry. This it is not simply negative debunking; it can make significant constructive contributions to the development of reliable knowledge.

The Committee for Skeptical Inquiry is part of the broader Center for Inquiry/Transnational movement. It likewise is committed to science, reason, and free inquiry in every area of human interest. This, we hope, will greatly enhance the cooperative worldwide efforts to extend the frontiers of scientific knowledge for the benefit of humanity. □

Energy Department Will End Most Polygraph Testing

KENDRICK FRAZIER

After years of controversy, ranging from complaints from national labs' scientists (SI, July/August 2001) to a critical National Academy of Sciences report (SI January/February 2003), the U.S. Department of Energy is ending required polygraph tests for thousands of workers at its nuclear weapons facilities, including most scientists at the three national weapons labs, Los Alamos, Lawrence Livermore, and Sandia.

In new requirements that went into effect October 30, 2006, DOE will no longer require polygraph tests as part of a general screening of new applicants, or automatically for employees in areas of high security. Tests will still be required for narrow purposes where there is specific cause.

The new requirements enact an earlier preliminary decision and recommendation to scale back polygraph testing reported to a Senate committee in September 2003 (SI, November/December 2003).

Current workers will still undergo broad security reviews on a periodic basis, as will new applicants. But, with narrow exceptions, the Associated Press reported in early October 2006, these workers will no longer be subject a "lie detector" test.

Up to 20,000 workers were at least theoretically subject to polygraph tests under the old program, which went into effect in 1999. Government officials gave no numbers for those who will be subject to polygraphs under the new criteria but say their use would be limited to workers whose jobs require them to work with or in other agencies that require polygraphs; those where there is "a specific indication" of a clandestine relationship with a foreign country, organization, or terrorist group; and those where a test is ordered in response to a specific incident or concern. DOE said a polygraph exam may also be administered as part of random counterintelligence evaluations.

"This is a significant retreat from the [more widespread] use of the polygraph," said Steven Aftergood, director of the project on government secrecy at the Federation of American Scientists. "DOE deserves credit for responding to the scientific critique and employee concerns" about the uncertainties surrounding polygraph tests, he said.

Employees complained that the tests, due to the prevalence of false positives, could improperly endanger their careers. The National Academy of Sciences study, issued in October 8, 2002, and chaired by Carnegie Mellon professor Stephen E. Fienberg, said the polygraph results are too inaccurate to be used for general screening of employees. It said the tests had "weak scientific underpinnings . . . belief in its accuracy goes beyond what the evidence suggests."

Legislation sponsored by Sen. Jeff Bingaman, D-New Mexico, then chairman of the Energy and Natural Resources Committee, and Sen. Pete Domenici, R-New Mexico, required DOE to overhaul its polygraph program based on the findings of the NAS report.

Kendrick Frazier is editor of the SKEPTICAL INQUIRER.

Moscow Roundtable Discusses False Science in Russia

Within the framework of the 2006 CFI/Amherst/CFI/Moscow International Summer School (held in Novosibirsk, Siberia), a roundtable discussion was held on Humanism, Science, and False Science in Russia on July 20. The major speaker, Edward Kruglyakov, Chair of the Committee against Antiscience of the Russian Academy of Sciences (see Kruglyakov, Edward, "Why Is Pseudoscience Dangerous?" SKEPTICAL INQUIRER, July/August 2002), presented a report on "Whether Russia Will Be Able to Avoid the New Rasputin Times."

He reviewed the most scandalous cases in the field of charlatanism in today's Russia. Kruglyakov reminded listeners that the extremely aggressive charlatan Grigori Grabovoi was finally arrested. Nevertheless, for a long time, Grabovoi had a mysterious immunity and was, according to his claims (such as those made in an interview on Radio Echo Moscow, September, 28, 2005), responsible for the security of President Putin's aircraft and for the aircraft of other presidents of the Commonwealth of the Independent States, "and he claimed to do it with the help of mental control."

His cynical activity was marked by his promise to resurrect more then 150 children, killed during a terrorist act in the town of Beslan (in the North Caucasus), for about $1,300. Last summer, on the television talk show, *Let's Talk*, he proclaimed himself the New Savior.

Kruglyakov said it has now become an unfortunate trend for top Russian bureaucrats to get scientific degrees. Some underpaid scholars are ready to make some extra money, and they do the dissertations for the politicians of various levels of government. The quality of such dissertations is very poor. Nevertheless, because of the corruption and connections of the clients, getting a PhD poses no problem. The shameful results of this practice occur within the highest levels of government.

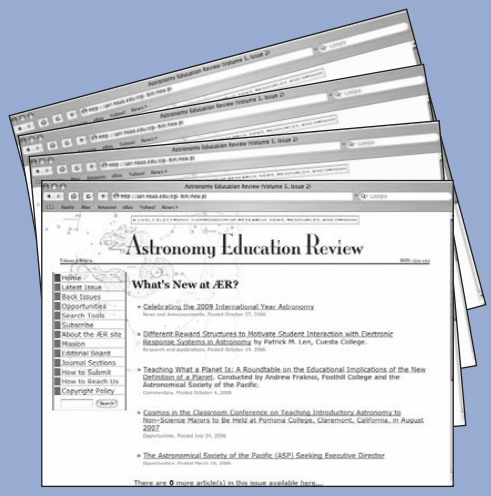
As an example, Kruglyakov analyzed the statement of the Vice Secretary of the Security Council of the Russian Federation, N. Spasskii, from his paper, "Preparing for G-8," which was published in the official governmental newspaper, *Rossiiskaya Gazeta* (April 24, 2006). In this paper, Spasskii proposes to revise some basic positions on the eve of the summit in St. Petersburg in July 2006. Among others subjects, this important official writes about the coming breakthroughs in energy sources (conducted thermonuclear synthesis, hydrogen, and vacuum energy.)

This statement, according to Kruglyakov, reveals the fact that this official has advisers who are either ignorant or charlatans. Until now, only yellow-press journalists would propose getting "energy from a vacuum." Never before have such statements been made on the state level, Kruglyakov said. According to him, hydrogen energy can solve relatively local problems, but it is not able to solve the problem of the world shortage of energy and cannot be the basis for the energy industry. As for thermonuclear synthesis (controlled fusion), it is a promising source of energy indeed. Nevertheless, we cannot expect this kind of energy to be a breakthrough technology in the near future.

As a participant in this round table, I may add only that these and many other such cases drastically undermine the image of Russia as a world energy supplier, as well as Putin's picture of Russia as an energy superpower.

—*Valerii Kuvakin*

Valerii Kuvakin is the chairman of the Center for Inquiry/Moscow.



Pluto/Planet Roundtable Now Online

If, like many educators, you are not quite sure what to do in your own work about the recent definition of *planet* by the International Astronomical Union, you may want to read what fourteen experts on planetary science and education think.

A roundtable in the online journal Astronomy Education Review (AER) looks at the science, politics, and educational implications of the controversy. It also includes a historical timeline and a guide to educational resources concerning the definition of a planet.

See it at the Web site http://aer.noao.edu—where it begins the tenth issue of the journal. When you go to the AER site, you can find the full ninth issue by clicking on "back issues" and then on "vol. 5, no. 1."

AER actively solicits interesting papers and articles on all aspects of space science education and outreach. The site gets over 200,000 hits per month from ninety-one countries.

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New Future Fund

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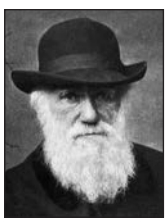
The **New Future Fund** is an ambitious campaign to support the Center for Inquiry, the Committee for Skeptical Inquiry, and the Council for Secular Humanism through endowment funding and support for expanded programming. The **New Future Fund** was launched after thorough study, and its goals reflect needs judged indispensable if the Center for Inquiry is to continue serving society as the leading champion of reason, scientific naturalism, and humanist values.

Opposing Creationism/ Intelligent Design



Intelligent design (ID) theory is creationism's new face, sparking some 70 new controversies in an astonishing *26 states*. CSICOP is gearing up to **fight back** with grassroots outreach to mobilize skeptics at the local level when ID proposals loom; a stimulating new Web site, www.csicop.org/creationwatch; and media outreach, from new literature to books to top-shelf online columnists.

As ID advocates plan to shoulder Darwin and the scientific viewpoint out of public schools, the **New Future Fund** helps CSICOP say **no!**

The Center for Inquiry has obtained United Nations recognition as a nongovernmental organization (NGO), opening new avenues for activism and human enrichment.

The Center for Inquiry presses for humanism, science, and reason worldwide. Centers for Inquiry have been established in Argentina, China, Egypt, France, Germany, India, Nepal, Nigeria, Peru, Russia, and elsewhere, pursuing regionally tailored agendas.

The Center and its affiliates have facilitated international meetings of humanists and skeptics for more than two decades. Your gift to the **New Future Fund** will help this transnational expansion continue.

Outreach

The Center for Inquiry movement began with publishing, still essential to our mission. *Skeptical Inquirer* and *Free Inquiry* headline a family of magazines in three languages, newsletters, and Web sites. Professional public education and media relations further amplify our message. Campus outreach presents our message of science and reason to the leaders of tomorrow.

Your gift to the **New Future Fund** can help to support core publishing outreach (this issue of *Skeptical Inquirer* is four pages longer than early-2005 issues, thanks to support from the **New Future Fund**), fuel our exploitation of new communications technologies, and fund more aggressive on-campus programs. The **New Future Fund** is key to the future promotion of skepticism, science, reason, and humanism by the Center for Inquiry and its affiliates.

Your gift to the **New Future Fund** can support these and other urgent priorities. We gratefully accept gifts of cash, publicly traded securities, paid-up insurance policies, and other assets. We are pleased to offer attractive incentive and naming opportunities to honor major contributors. All gifts are fully tax-deductible as provided by law. Campaign personnel are available to meet with donors to provide updates on our plans and to discuss other commemorative opportunities tailored to particular needs and interests.

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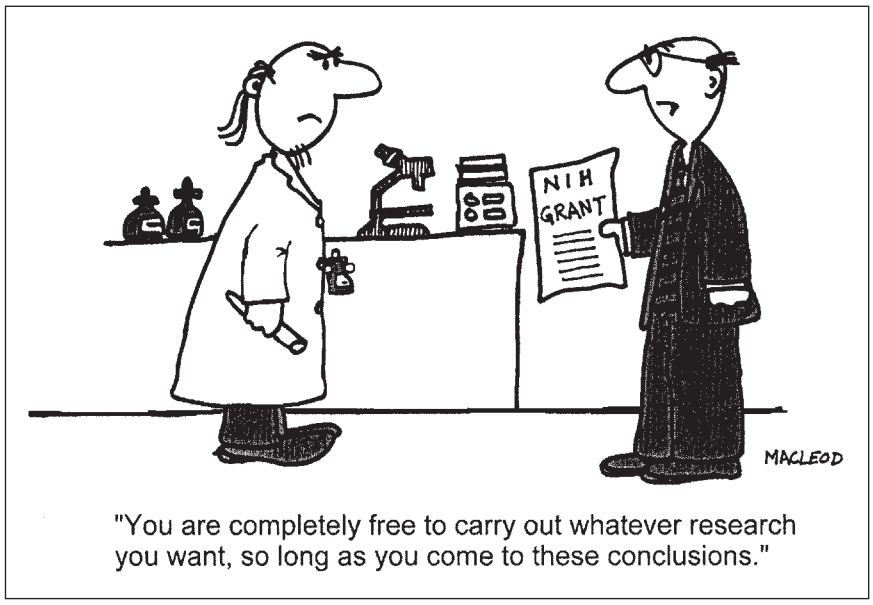
UCS Releases Science Idol Calendar

The Union of Concerned Scientists (UCS), in response to the many ways in which "government science is being censored, manipulated, and distorted on an unprecedented scale," conducted Science Idol: The Scientific Integrity Editorial Cartoon Contest.

More than four hundred entries were received in response to the organization's call for submissions of cartoons humorously depicting some aspect of the unfortunate trend. The field was winnowed by UCS to the twelve finalists whose work appears in the calendar, with the help of editorial cartoonists Tony Auth (of *The Philadelphia Inquirer*) and Clay Bennett (of *The Christian Science Monitor*), Bob Mankoff (the cartoon editor for *The New Yorker*), and Hilary Price (the creator of the daily comic strip *Rhymes with Orange*). Then, the final winner was selected from the remaining field by a vote taken among UCS members and supporters.

James MacLeod, of Evansville, Indiana, submitted the work that was chosen as the top entry. Besides having his cartoon appear in the 2007 Scientific Integrity Calendar and the UCS magazine, *Catalyst*, MacLeod will receive a $500 cash prize, an autographed copy of *Dude: The Big Book of Zonker*, by Gary Trudeau, a copy of the calendar autographed by the four celebrity judges, and fifty copies to distribute to his friends and family; he will also have lunch with Bob Mankoff. The other eleven finalists will each receive a signed copy of the calendar. (MacLeod's cartoon appears above.)

Regarding the purpose of the contest and the calendar that it produced, Michael Halpern, Outreach Coordinator for the UCS Scientific Integrity Program, said, "While editorial cartoons can be funny, political interference in science is not. The calendar communicates the impact of political interference on our health, safety, and environment in a very accessible way. And as a bonus, the calendar is packed with interesting dates in science history.


NIH GRANT
MACLEOD
"You are completely free to carry out whatever research you want, so long as you come to these conclusions."

James MacLeod/UCS

"We hope that scientists and non-scientists alike will use the calendar first for a laugh—for the cartoons are quite funny—but also as an educational tool to teach their friends and family about the importance of restoring scientific integrity to federal policy making."

The calendar is available from UCS; go to www.ucsusa.org/scientific_integrity/science_idol/ and click on "2007 scientific integrity calendar" for more information.

—David Park Musella

David Park Musella is an editorial assistant with the SKEPTICAL INQUIRER. □

Michigan Supports Evolution, Rejects ID for Science Classes

Add Michigan to the list of states that have given intelligent design the bum's rush. Michigan's state Board of Education on October 10, 2006, approved public school curriculum guidelines that support the teaching of evolution in public schools, but not intelligent design. Intelligent design doesn't belong in the science class, according to the guidelines unanimously adopted. "The intent of the board needs to be very clear," said board member John Austin. "Evolution is not under stress. It is not untested science."

World Trade Center Illness: Manufactured Mass Hysteria

MICHAEL FUMENTO

Starting in early 2002, firefighters who responded to the World Trade Center (WTC) on that awful day the previous September began reporting what became labeled "World Trade Center Cough." Since then, numerous other first responders, later responders, and people who simply lived in the general WTC area have also reported a variety of respiratory and other ills.

Clearly, these people are suffering. But are they suffering from a variety of toxins or alleged toxins that filled the air after the fiery explosions? Or is their problem stress-caused psychogenic illness with perhaps some non-psychogenic illness mixed in?

Some scientific papers indicate stress as a major factor. But the media always favor the multiple toxin or "environmental illness" theory, and now insist as a chorus that a new report from the Mount Sinai School of Medicine in the journal *Environmental Health Perspectives* has settled it.

"Many who worked at Ground Zero in the early days after the attacks have sustained serious and lasting health problems as a direct result of their exposure to the environment there," Dennis Charney, Mount Sinai's dean for academic and scientific affairs, said in a statement issued with the study.

What the report found was that 69 percent of some 9,500 responders said they suffered new or worsened breathing problems at the time of their WTC work. Further, in 59 percent symptoms persisted until their examinations (conducted from 2002 to 2004). But these are self-reported claims with no way of verifying them.

The best indication these people have real symptoms is that, among nonsmoking responders, twice as many had abnormal readings on spirometer (a device that accurately measures your ability to breathe) as the general population.

Case closed? Not by a long shot.

One glaring problem is that those 9,500 evaluated in the Mount Sinai study aren't a representative sample of responders, merely an assessment of specific responders from a total of about 40,000.

That is, this is not an epidemiological study, which would deliberately "want a group of people who are selected using a sampling design, where the group represents a study population," observes John Fairbank, co-director of the UCLA-Duke University Medical Center National Center for Child Traumatic Stress. "This doesn't."

This study looked only at the minority of responders who came to Mount Sinai to have their health monitored. People who participate in such medical studies tend to do so because they believe they're sick. So you can't make any meaningful comparisons to responders who didn't volunteer for the study or to the general public. They simply aren't random or representative. This problem alone wholly invalidates the significance that Mount Sinai and the media gave the report.

But what about those spirometer readings? All this device (invented 150 years ago) can do is measure breathing capacity. And labored breathing is a main symptom of psychogenic illness.

Ultimately, nothing in the report offers the least shred of evidence that the suffering responders aren't by and large suffering from psychogenic illness. The term is commonly misinterpreted as meaning "it's all in your heads." But it actually means the symptoms can be quite real and debilitating but that they originated with stress. September 11 is synonymous with stress for the entire nation, and certainly far more so for the responders.

Medical annals are filled with incidents of mass psychogenic illness hysteria. For example, in Kosovo in 1990 at least 4,000 residents suffered a mystery illness that began at a high school. Observed researchers: "An outbreak of respiratory infection within a single class appears to have triggered fears that Serbs may have dispensed poison." They hadn't. Rumors of Israeli-spread

Michael Fumento, a former Army paratrooper, is a senior fellow at the Hudson Institute, and the author of Science Under Siege *and* The Myth of Heterosexual AIDS. *This article originally appeared on the Web site ChronWatch (www.chronwatch.com).*

poison gas caused a similar mass outbreak of illness among West Bank Palestinians in 1983.

That brings us to perhaps the most distressing aspect of the WTC outbreak. In addition to the trauma experienced at the WTC site, the best explanation for these ills is that they have been induced by the media and select scientists who steadily beat the drum insisting that responders ought to be sick. The bastion of these scientists since 2002 has been—surprise!—Mount Sinai.

Indeed, no other institution is more associated with pushing the oddball theory of "environmental illness" than this one. Mount Sinai and the sycophantic media are no friends of those brave men and women who rushed to the World Trade Center on 9/11 or helped in the cleanup; they are their tormenters.

Our heroes deserve our compassion and help for their WTC-related illnesses, whether psychogenic or not. But true compassion begins with informing them that there is no scientific evidence indicating they should be sicker than anyone else, at least not from environmental causes.

New Report Casts Doubt on Gulf War Syndrome

BENJAMIN RADFORD

A study recently published by the National Academy of Sciences casts doubt on the reality of Gulf War Syndrome (GWS) as a specific disease or syndrome. About 60,000 of the nearly 700,000 Gulf War veterans began reporting health problems in the months and years following their military service. Complaints include insomnia, irritability, hair loss, chronic fatigue, muscle spasms, skin rashes, memory loss, diarrhea, headaches, and unexplained aches and pains. Some veterans believe that GWS is also responsible for birth defects and cancer; others claim that GWS is a sexually transmitted disease that threatens the health of not only the veterans but their spouses and partners as well.

Oil fires in Kuwait are claimed to have contributed to Gulf War veterans' disabilities. Photo by Jim Hodson/Greenpeace/ZUMA Press. Copyright 1991 by Greenpeace

The precise etiology of Gulf War Syndrome is very difficult to pinpoint; nearly everyone agrees that many veterans are suffering; the question is whether the symptoms are related in any way to military service and have a common cause. The controversy over Gulf War Syndrome—now in its second decade—highlights the difficulties of scientific and medical certainty, as well as a common logical fallacy: *post hoc ergo propter hoc* ("after this, therefore because of it"). Gulf War veterans may assume that because they became ill after their tour of duty, that experience is what caused their symptoms. While that may indeed be true, the maladies could also be from any number of other, unrelated causes. Part of the problem is that the symptoms are so diverse—and so common—that attributing a specific cause to a specific illness can be difficult or impossible. Is a skin rash or persistent cough caused by toxic chemicals inhaled years ago at an Iraqi munitions dump, or toxic chemicals inhaled over months or years from a nearby, polluting factory upwind? Or both, or neither?

In the real world, correlation can be very difficult to distinguish from causation:

Benjamin Radford wrote about conversion disorders in Hoaxes, Myths, and Manias, *co-authored with Robert Bartholomew.*

Links that may seem obvious are not always clear. For example, many lifelong smokers never get lung cancer, while many nonsmokers do. To find out which if any of the myriad substances the veterans were exposed to caused the illnesses, we would need a control group: two sets of patients in the same condition, only one of whom was exposed to a given pathogen.

While some Gulf War veterans claim that their plight has been ignored, action has been taken to study the syndrome. In 1996, a panel appointed by President Clinton concluded that "significant evidence supports the likelihood of a physiological stress-related origin" for many GWS ailments. While the conclusion is probably true, the public should be skeptical of "stress" as an explanation, for though the ability of the body to convert psychological symptoms into physical ones is well documented, citing the cause of a disease as stress is of little profit. *Stress* is a notoriously fluid catch-all term that is difficult to both define and quantify. This is especially true when dealing with nonspecific stressors. There's little doubt that many things cause concern and stress every day, ranging from traffic jams to infidelity to wartime combat. But stress is highly subjective, and what stresses one person may not at all affect someone else in similar circumstances. (As noted in the November/December 2004 SI article "Bacteria, Ulcers, and Ostracism? *H. Pylori* and the Making of a Myth," for decades stomach ulcers were wrongly believed by both doctors and the general public to be caused by stress. Many other common maladies and symptoms, ranging from headaches to violence to sexual dysfunction, are also—rightly or wrongly—attributed to stress.)

In 1996, CIA Executive Director Nora Slatkin addressed the contention that Iraqi chemical weapons (such as nerve gas) caused the symptoms, stating that "On the basis of a comprehensive review of the intelligence that we have, we continue to conclude that Iraq did not use chemical or biological weapons during the Gulf War." Nonetheless, many critics, including Sen. Arlen Specter, continued to insist that nerve gas was a contributing factor to GWS. The Pentagon was criticized in later years for not doing more to track which American troops were exposed to which toxins, as well as administering inadequate pre- and post-deployment health measures. (Some veterans may be sick when they leave the military, but without having a statistical baseline to determine how healthy they were to begin with, such numbers are difficult to interpret.) Despite claims of a cover-up, however, investigations have not found any evidence that the Pentagon intentionally hid or suppressed information about GWS.

In 1998, Congress passed two laws regarding the illnesses, the Persian Gulf War Veterans Act and the Veterans Programs Enhancement Act. These measures contracted the National Academy of Sciences to "review and evaluate the the scientific and medical literature regarding associations between illness and exposure to toxic agents, environmental wartime hazards, and preventive medicines or vaccines associated with Gulf War service." The Committee on Gulf War and Health did not collect any original data, instead focusing on 850 potentially relevant, peer-reviewed epidemiological studies. The committee published its finding in a 2006 report, "Gulf War and Health." The report noted that the studies' conclusions were clouded by many common limitations, including "use of a population that was not representative of the entire Gulf War population, reliance on self-reports rather than objective measures of symptoms, low participation rates, and a period of investigation that was too brief to detect health outcomes with long latency such as cancer."

Every study examined found that Gulf War veterans "report higher rates of nearly all symptoms examined than their nondeployed counterparts. . . . In many studies, investigators found a higher prevalence not only of individual symptoms but also of chronic multisymptom illnesses among Gulf War-deployed veterans than among the nondeployed." However, the report notes, "there are no clear objective diagnostic criteria that can be used to validate the findings, so it is not clear whether the literature supports a true excess of the conditions or whether the associations are spurious and result from the increased reporting of symptoms across the board."

The report states that despite the "enormous effort and resources" devoted to examining GWS, "The information has not been sufficient to determine conclusively the origins, extent, and potential long-term implications of [Gulf War service] health problems. . . .The difficulty in obtaining meaningful answers . . . is due largely to inadequate predeployment and postdeployment screening and medical examinations, and lack of monitoring of possible exposures of deployed personnel." These shortcomings were addressed in the committee's recommendations section.

The study found that there was "no unique syndrome, unique illness, or unique symptom complex in deployed Gulf War veterans." As expected, veterans were at increased risk for several psychiatric illnesses, such as post-traumatic stress disorder, anxiety, and depression. Among those symptoms that could be measured with diagnostic tests, studies did not find an increase in cancer, birth defects, cardiovascular disease, or peripheral neuropathy. Veterans were at greater risk of respiratory illnesses, and there was some evidence that veterans had an increased likelihood of amyotrophic lateral sclerosis.

Many Gulf War veterans angrily rejected the latest study's findings, as they did previous reports and studies that did not support their conclusions. Often this is because they mistakenly believe that if the syndrome is not proven "real," that somehow relegates the suffering veterans to liars, hoaxers, or fabulists. Instead, as with mass hysteria, those truly suffering from the illness are not faking or imagining the symptoms; instead they are simply misattributing the cause. □

The Art of Persuasion in Politics (and Science)

BENJAMIN WOLOZIN

Advocating for science is more important than ever. Funding for many scientific endeavors is being reduced. Much of the public does not believe in evolution. Advances in stem-cell biology and genetic engineering are under attack. And many politicians and much of the public discount warnings about global warming.

It is often perplexing that science's critics appear to be immune to the tremendous amount of data driving our conclusions and instead seem to rely on weak or dubious facts criticizing each subject. Whether the topic is evolution, global warming, stem cells, or abortion, how often have we had the experience of trying to persuade someone why our view of the world is accurate, only to have the arguments dismissed? How can the public ignore the overwhelming evidence?

George Lakoff is a cognitive psychologist and linguist from the University of California, Irvine. His specialty is cognitive constructs. He has taken this theoretical knowledge and applied it to politics. His analysis is simple but very cogent. His book *Don't Think of an Elephant: Know Your Values and Frame the Debate* (Chelsea Green Publishing 2004), now available in paperback, provides an important new model for understanding the art of political persuasion.

Lakoff's basic idea is the powerful role cognitive frameworks exert in our understanding of the world. He summarizes research showing that individuals develop cognitive frameworks to help them organize the information in the world around them. A simple example is the issue of abortion. Conservatives frame the abortion debate as a debate about protecting life, which is a powerfully simple argument. They have used the power of this moral argument to frame the conservative agenda. We use such cognitive frameworks to interpret the many facts confronting us every day. We attend to facts that integrate easily with the cognitive framework and tend to dismiss facts that are not consistent with our views.

Scientists also use cognitive frameworks for understanding disparate facts. For example, in my field, Alzheimer's disease, many scientists use the amyloid-cascade hypothesis to understand the disease process. This hypothesis clearly does not explain all aspects of Alzheimer's disease, but its utility lies in its tremendous ability to facilitate interpreting the massive amount of data streaming through the literature daily. Lakoff argues that appreciating the role of cognitive frameworks in human behavior is essential in engaging in public debates, because it explains how people take in information and why people tend to dismiss facts that conflict with their views.

The book's fundamental message is that to be persuasive, speakers must address the underlying cognitive framework first, and they must provide an alternative framework willing to be considered by the listener before mentioning any facts. Unless the listener accepts the new framework, the listener will dismiss any facts that disagree with their existing cognitive framework and all arguments will fail. Lakoff's model explains why the vast amounts of facts provided by scientists and the powerful import of the data that we obtain frequently appear to bounce off the ears of the audience, such as those who don't accept evolution, global warming, or stem-cell research.

The book begins by noting some well-known contradictions apparent in the conservative movement. For instance, conservatives are generally pro-capital-punishment but anti-abortion. How can they favor death on the one hand but oppose it on the other? Contradictions, though, are not unique to conservatives. The liberal platform is equally contradictory, because liberals are against capital punishment but in favor of abortion. Lakoff resolves this apparent contradiction with a very simple model.

Lakoff proposes that conservatives operate using a "strong-father" model. The model begins from the basic idea that the father rules the family and is the authority. This model places immense reliance on the value of rules and authority. This model presupposes that the father has prospered because of his hard work, innate abilities, and adherence to the rules. A further assumption is that all who follow this dogma will be successful. Based on the strong-father model, the father should be rewarded because of his success, as should everyone else who prospers because he or she has followed the social rules.

In this model, following the social rules leads to social and economic success, while those who did not succeed must have failed because they did not follow the rules. Thus, the "bad boy"

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grows up to be poor. The poor, therefore, should not be rewarded (with benefits such as welfare, Medicare, and food stamps). The value of rules also guides the punitive code, because those who break the law must be punished harshly, such as by use of capital punishment. The strong father is the patriarch, and the wife's place is subordinate to her husband. Many conservatives loathe Hillary Clinton. According to Lakoff's theories, the principal mistake of Hillary Clinton might be that she acted as an independent and coequal entity to her husband, the elected leader.

The strong-father model also provides an underlying explanation for the conservative backlash against abortion: young women who get pregnant accidentally get into that situation because they disobey the traditional rules against premarital sex; such misbehavior must not be rewarded with an abortion. Economic success and the rights of the individual patriarch are also paramount in the strong-father model. Laws that interfere with economic success, such as environmental laws or tax laws, must be removed; taxes are assumed to remove money that was justly earned by following the social rules.

Lakoff states that liberals, on the other hand, operate using the "nurturing-parent" model. This model views that family as a collection of relative equals (as portrayed in Hillary Clinton's book, *It Takes a Village*). In this model, the goal of the parent is to support the rest of the family. The family succeeds as a cooperative enterprise. Those who don't succeed, the poor, need to be helped by the enterprise. Criminals are those who suffer from misfortune and should be helped. Younger women who get pregnant are not bad; they just had bad fortune and should be helped. Laws are present to help spread the fortune of the family. Environmental laws protect the community over the rights of the individual.

Over the years, public sentiment has shifted towards the strong-father model. The shift in sentiment emphasizes the fluidity of public opinion. Lakoff points out that many individuals use a strong-father model in one part of their lives and a nurturing-parent model in other parts of their lives. The key to conveying alternate ideas is to provide a new construct that the listener can use to interpret your message. Lakoff points out that one must be careful in selecting the language, because the language frames the issue. Use of the term *tax relief* by conservatives presupposes that there is a problem that needs relief. Who could argue against the need for relief, which sounds helpful? Anyone who does not address this underlying assumption will not be able to argue against it. An alternative term would be *deficit-raising tax cuts*. Who could possibly be in favor of those?

Scientists frequently use facts to argue a point without bothering to address differences in the underlying cognitive framework.

Lakoff urges us to practice using terms that frame the issue and cognitive constructs that support our point of view. I have tried this and found it to be remarkably effective. For instance, I was on a plane talking about the cuts to the National Institutes of Health budget with a conservative. When I simply discussed government spending, he showed no willingness to listen to my comments. Then I remembered Lakoff's words and made an analogy to businesses (the man was a financial manager for a shoe company). I presented the idea that businesses that don't invest don't grow and stagnate. The business model was a cognitive framework with which he identified. He embraced that idea and suddenly became very amenable to considering the damage done to the United States by the tax cuts and budget deficits, ultimately agreeing wholeheartedly that the current political agenda was damaging the nation's competitiveness. Without an alternative cognitive framework, he never would have considered my comments.

Some people will never accept an alternate model, but even those who might accept one can't be expected to automatically accept a new point of view. The key, according to Lakoff, is to provide a "wedge issue" that confronts the listener with a situation that challenges her or his existing model. Partial-birth abortion has been used effectively by Republicans; very few of these procedures are ever performed, but the frequency is irrelevant, because the idea of killing a late-term fetus is distressing. Lakoff provides the example for Democrats of a female soldier who is raped on the battlefield. This soldier cannot be provided with a morning-after pill or an abortion by a military hospital, despite the honor we should pay her for having enlisted and risking her life for her country.

The book provides a powerful explanation of the recent domination of the political culture by the Republicans. After reading the book, I certainly came to respect the audacious brilliance of Karl Rove and the conservative think tanks.

This book is a must read for anyone who wants to discuss scientific issues in the public arena. Unless scientists can provide simple cognitive frameworks for understanding scientific advances, scientists are destined to lose debates in the public sphere. The dangers of rising oceans and climate shifts that could be caused in the future by global warming are far too abstract for most people to worry about. On the other hand, people can easily understand that a water stain in the ceiling of one's house means a problem with the roof rather than the ceiling, and that the home owner must correct the underlying problem of the leaky roof or the stain in

the ceiling will just get worse. Global warming is a similar problem: weeks of temperatures over 110 degrees in Phoenix will only get worse unless we pay attention to the atmosphere. Evolution must also be explained in concrete terms, relevant to everyone's daily experience. The fossil record can be likened to a crime-scene investigation. If your front door is open and your television is missing and you see footsteps on your floor from a shoe larger than that of anyone in your household, it is reasonable to conclude that an intruder was in the house, even though you never saw the intruder. The fossil record is no different.

Science also provides us with a powerful arsenal of wedge issues, if used correctly. Many people have a loved one with an illness that can only be cured by advances in health care. Parkinson's disease, diabetes, or Crohn's disease provide important incentives for considering the value of stem cells and for challenging the notion that a single stem cell has the same right to life as a thinking, breathing, individual. The application of pro-apoptotic genes discovered in *C. elegans* for the diagnosis and therapy of cancer in man emphasizes the similar mechanisms used by disparate life forms and provides a powerful reference for explaining the evolution of genes. Everyone wants a cure for cancer and might consider the value of evolutionary theory in that context.

Scientists frequently use facts to argue a point without bothering to address differences in the underlying cognitive framework. Many of our politicians, such as John Kerry, also use this approach and are singularly unpersuasive. On the other hand, George Bush is very skilled at focusing on the underlying cognitive framework. This book emphasizes the futility of facts presented without first providing an acceptable cognitive framework. Lakoff provides a new paradigm for discussing contemporary issues. One of the greatest problems facing our society is that many of the cognitive frameworks provided by many conservatives and some liberals run contrary to discoveries made through scientific investigation; cognitive frameworks that deny reality are a long-term threat to our society.

Scientists must develop simple cognitive models that are relevant to people's daily lives; frameworks through which the public can hear us. Armed with these simple models and the wedge issues that are the bread and butter of our work, we represent a powerful resource that can move the public discussion to pragmatically address the issues of the day and develop policies that benefit rather than hurt the lives of our children. □

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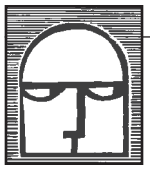

'Dr.' Bearden's Vacuum Energy

One of the strangest books ever written about modern physics was published in 2002, and reprinted two years later. Titled *Energy from the Vacuum* (Cheniere Press), this monstrosity is two inches thick and weighs three pounds. Its title page lists the author as "Lt. Col. Thomas E. Bearden, PhD (U.S. Army retired)."

"Dr." Bearden is fond of putting PhD after his name. An Internet check revealed that his doctorate was given, in his own words, for "life experience and life accomplishment." It was purchased from a diploma mill called Trinity College and University—a British institution with no building, campus, faculty, or president, and run from a post office box in Sioux Falls, South Dakota. The institution's owner, one Albert Wainwright, calls himself the college "registrant."

Bearden's central message is clear and simple. He is persuaded that it is possible to extract unlimited free energy from the vacuum of space-time. Indeed, he believes the world is on the brink of its greatest technological revolution. Forget about nuclear reactors. Vacuum energy will rescue us from global warming, eliminate poverty, and provide boundless clean energy for humanity's glorious future. All that is needed now is for the scientific community to abandon its "ostrich position" and allow adequate funding to Bearden and his associates.

To almost all physicists this quest for what is called "zero-point energy" (ZPE) is as hopeless as past efforts to build perpetual motion machines. Such skepticism drives Bearden up a wall. Only monumental ignorance, he writes, could prompt such criticism.

The nation's number two drumbeater for ZPE is none other than Harold Puthoff, who runs a think tank in Austin, Texas, where efforts to tap ZPE have been underway for years. In December 1997, to its shame, *Scientific American* ran an article praising Puthoff for his efforts. Nowhere did this article mention his dreary past.

Puthoff began his career as a dedicated Scientologist. He had been declared a "clear"—a person free of malicious "engrams" recorded on his brain while he was an embryo. At Stanford Research International, Puthoff and his then-friend Russell Targ claimed to have validated "remote viewing" (a new name for distant clairvoyance), and also the great psi powers of Uri Geller. (See my chapter on Puthoff's search for ZPE in *Did Adam and Eve Have Navels?*, Norton 2000.)

Bearden sprinkles his massive volume with admirable quotations from top physicists, past and present, occasionally correcting mistakes made by Einstein and others. For example, Bearden believes that the graviton moves much faster than the speed of light. He praises the work of almost every counterculture physicist of recent decades. He admires David Bohm's "quantum potential" and Mendel Sach's unified field theory. Oliver Heaviside and Nikola Tesla are two of his heroes.

Bearden devotes several chapters to antigravity machines. Here is a sample of his views:

> In our approach to antigravity, one way to approach the problem is to have the mechanical apparatus also the source of an intense *negative energy* EM field, producing an intense flux of Dirac sea holes into and in the local surrounding space-time. The excess charge removed from the Dirac holes can in fact be used in the electrical powering of the physical system, as was demonstrated in the Sweet VTA antigravity test. Then movements of the mechanical parts could involve movement of strong negative energy fields, hence strong curves of local space-time that are local s*trong negative gravity fields*. Or, better yet, movement of the charges themselves will also produce field-induced movement of the Dirac sea hole negative energy. This appears to be a practical method to manipulate the metric itself, along the lines proposed by Puthoff et al.[217]

Martin Gardner's latest book is The Annotated Hunting of the Snark: The Definitive Edition*, published by W.W. Norton in October 2006. This column is a new contribution to his Notes of a Fringe Watcher column, which ran in every issue of* SKEPTICAL INQUIRER *from Summer 1993 through January/February 2002.*

The 217 superscript refers to a footnote about a 2002 paper by Puthoff and two friends on how to use the vacuum field to power spacecraft. Bearden's antigravity propulsion system is neatly diagrammed on page 319. "Negatively charged local space-time," says the diagram, "acts back upon source vehicle producing anti-gravity and unilateral thrust."

In the 1950s, numerous distinguished writers, artists, and even philosophers (e.g., Paul Goodman, William Steig, and Paul Edwards) sat nude in Wilhelm Reich's "orgone accumulators" to absorb the healing rays of "orgone energy" coming from outer space. Bearden suspects (in footnote 78) that orgone energy "is really the transduction of the time-polarized photon energy into normal photon energy. We are assured by quantum field theory and the great negentropy solution to the source charge problem that the instantaneous scalar potential involves this process." I doubt if the Reichians, who are still around, will find this illuminating.

To my amazement Bearden has good things to say about the notorious "Dean drive"—a rotary motion device designed to propel spaceships by inertia. It was promoted by John Campbell when he edited *Astounding Science Fiction*, a magazine that unleashed L. Ron Hubbard's Dianetics on a gullible public and made Hubbard a millionaire. Only elementary physics is needed to show that no inertial drive can move a spaceship in frictionless space. On pages 448–453 Bearden lists eighty patents for inertial drives. They have one feature in common: none of them works.

Counterculture scientists tend to be bitter over the "establishment's" inability to recognize their genius. Was not Galileo, they like to repeat, persecuted for his great discoveries? This bitterness is sometimes accompanied by paranoid fears, not just of conspiracies to silence them, but also fears of being murdered. Bearden's pages 406–453 are devoted to just such delusions.

Several kinds of "shooters" are described that induce fatal heart attacks. He himself, Bearden writes, has been hit by such devices. An associate, Stan Meyer, died after a "possible" hit by a close-range shooter. Another ZPE researcher was killed by a bazooka-size shooter. Steve Marikov, still another researcher, was assaulted by a sophisticated shooter and his body thrown off a rooftop to make it appear a suicide. When his body was removed, the pavement "glowed."

One day at a Texas airport a person three feet from Bearden was killed with symptoms suggesting he was murdered by an ice-dart dipped in curare! "That was apparently just to teach me 'they' were serious." The colonel goes on to explain that "they" refers to a "High Cabal" who were offended by a friend's "successful transmutation of copper (and other things) into gold. . . . We have had numerous other assassination attempts, too numerous to reiterate. . . . Over the years probably as many as fifty or more overunity researchers and inventors have been assassinated . . . some have simply disappeared abruptly and never have been heard from since." *Overunity* is Bearden's term for machines with energy outputs that exceed energy inputs.

> Any significant researcher should be wary of "meeting with a sudden suicide" on the way to the supermarket. Another thing to beware of, is a calibrated auto accident where your car is rammed from the rear, and you are shaken up considerably. An ambulance just happens to be passing by moments later, and it will take you to the hospital. If still conscious, the researcher must not get in the ambulance unless accompanied by a watchful friend who understands the situation and the danger. Otherwise, he can easily get a syringe of air into his veins, which will effectively turn him into a human vegetable. If he goes to the hospital safely, he must be guarded by friends day and night, for the same reason, else he runs a high risk of the "air syringe" assassination during the night.
>
> Simply trying to do scientific work, I find it necessary to often carry (legally) a hidden weapon. Both my wife and I have gun permits, and we frequently and legally carry concealed weapons.
>
> As early as the 1930s, T. Henry Moray—who built a successful COP>1.0 power system outputting 50kW from a 55 lb power unit—had to ride in a bulletproof car in Salt Lake City, Utah. He was repeatedly fired at by snipers from the buildings or sidewalk, with the bullets sometimes sticking in the glass. He was also shot by a would-be assassin in his own laboratory, but overpowered his assassin and recovered.

In the 1950s, numerous distinguished writers, artists, and even philosophers sat nude in Wilhelm Reich's "orgone accumulators" to absorb the healing rays of "orgone energy" coming from outer space.

Obviously, I'm not competent to wade through Bearden's almost a thousand pages to point out what physicists tell me are howlers. I leave that task to experts, though I suspect very few will consider it worth their time even to read the book. To me, a mere science journalist, the book's dense, pompous jargon sounds like hilarious technical doubletalk. The book's annotated glossary runs to more than 120 pages. There are 305 footnotes, 754 endnotes, and a valuable seventy-three-page index.

The back cover calls the book "the definitive energy book of the twenty-first century." In my opinion it is destined to be the greatest work of outlandish science in both this and the previous century. It is much funnier, for instance, than Frank Tipler's best-seller of a few decades ago, *The Physics of Immortality*. □

Mysterious Entities of the Pacific Northwest, Part I

Mankind's imagination has always been excited by the possibilities of unknown regions. Thus, a seemingly limitless universe invites speculation about extraterrestrials; the world's largely unexplored oceans and seas, even deep lakes, prompt thoughts of leviathans; similarly, vast wilderness areas of the globe spark belief in other strange creatures, including various man-beasts; and belief in the great, imagined "Other Side" leads to tales of such entities as ghosts and spirits.

In mid-2006, I was aboard a Center for Inquiry cruise that traveled north from Seattle, Washington, along the coastal reaches of British Columbia and southern Alaska. As part of our floating conference on "Planetary Ethics"—featuring an address on that crucial topic by CFI chairman Paul Kurtz—we visited Glacier Bay and were treated to lectures on global warming and the melting of the world's glaciers by Mark Bowen, author of *Thin Ice* (2005). Among other speakers, Barbara Forrest critiqued recent attacks on the teaching of evolution.

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I spoke on "Mysterious Entities of the Pacific Northwest," which I specially researched for the cruise, and—as opportunity presented itself—I was also able to do a bit of on-site investigating relating to that topic as we occasionally put into port. Here is an overview of what I found.

Sasquatch

The area our cruise skirted is part of the Pacific Northwest, an area loosely encompassing northern California, Washington state, Oregon, British Columbia, and southern Alaska. It contains some of the most extensive forests in North America which, some claim, is home to the fabled Sasquatch (although sightings exist in other states and countries).

The name "Sasquatch" is often said to be Native American; actually it was coined by a Canadian schoolteacher J.W. Burns, in the 1920s. Her Native Coast Salish informants had different names for various unknown hairy giants, the British Columbian version being known as *sokqueatl* or *soss-q'tal*. Burns wanted to invent a single term for all of the alleged creatures (Coleman and Clark 1999, 215; Alley 2003, 9). This began a process of homogenization that helped turn various imaginative wild-man concepts into an increasingly uniform type, as we shall see. (I have been investigating this process for many years, just as I did for extraterrestrials which culminated in my pictorial chart, "Alien Timeline" shown in the September/October 1997 SKEPTICAL INQUIRER.)

The earliest record of potential Sasquatch footprints is dated 1811 when David Thompson, a trader and explorer, was seeking the mouth of the Columbia River. Crossing the Rockies at what is today Jasper, Alberta, he came upon a mysterious track in the snow. It measured fourteen inches long by eight inches wide and was characterized by four toes with short claw marks, a deeply impressed ball of the foot, and an indistinct heel imprint (Green 1978, 35–37; Hunter 1993, 16–17). Some modern Sasquatch enthusiasts have suggested it was the legendary man-beast, but primate expert John Napier of the Smithsonian Institution was not so sure.

Napier observed (1973, 74) that Thompson's description was "an inadequate basis for any far-reaching conclusions." He argued that the print could well have been that of a bear (whose small inner toe may not have left a mark); Thompson himself thought it likely "the track of a large old grizzled bear" (qtd. in Hunter 1993, 17).

Contrastingly, in 1847, a very different type of wild man was reported. Artist Paul Kane was in Washington, in sight of Mount St. Helens volcano, which, the Indians asserted, was "inhabited by a race of beings of a different species, who are cannibals, and whom

they hold in great dread." Called "skoocooms" or "evil genii," however, they appear to have been seen as supernatural rather than natural beings. In any case, Kane did not refer to them as ape-like (Hunter 1993, 17–18).

The supposed capture of Sasquatch was reported in the Victoria, British Columbia, *Daily Colonist* on July 4, 1884. Railway men had allegedly captured a hairy "half-man, half beast," only four-feet-seven-inches tall and weighing 127 pounds. Dubbed "Jacko," it was allegedly being kept in an area jail, but was to be taken to London to be exhibited.

Although some have suggested Jacko could have been an escapee from a touring circus menagerie, it seems more likely he never existed. He was never heard from again, except that a later newspaper article—in the July 9, 1884, *Mainland Guardian*—indicated the story had been a hoax, apparently perpetrated by a reporter for the *Daily Colonist* (Stein 1993, 246–247).

Certainly, hoaxes characterized many Sasquatch reports throughout the next century. A case from 1924 may be one of them. A man named Fred Beck and several fellow prospectors claimed to have shot at several "mountain gorillas" in a canyon near Kelso, Washington. They insisted that that night the creatures bombarded their cabin with rocks and beat upon the door and roof. At daybreak the attack had ceased and giant footprints were found around the cabin (Bord and Bord 1982, 41–42). However, rumors have since persisted that pranksters living in the vicinity had planted the footprints and thrown the rocks (Daegling 2004, 59–70).

Another case took place in 1930, near Mount St. Helens. Some people who had been picking berries returned to their cars to discover huge, manlike tracks circling the area. Excitedly, they reported the tracks to nearby forest rangers, but for more than half a century the tracks remained a mystery. Then in 1982 Rant Mullens, a retired logger who had been working for the Forest Service at the time of the tracks appeared, confessed that he had been involved in faking the giant footprints. As a prank, he had carved from a piece of wood a pair of nine-by-seventeen-inch feet. A friend of Mullens, Bill Lambert, had then strapped them onto his own feet and tromped about the area where the berry pickers' cars were parked (Dennett 1982). Since then, more realistic footprints have appeared, curiously following extensive published descriptions of what genuine Sasquatch/Bigfoot should be like. So has other evidence.

The 1950s were a watershed in Sasquatch's history. In 1951 the footprint of a yeti or "abominable snowman" from the Himalayas was photographed by explorer Eric Shipton and received considerable media attention—in California and elsewhere across the United States and even the world.

In 1955, one William Roe claimed to have observed a female Sasquatch for a few minutes at close range. Two years later Albert Ostman swore that, some thirty-three years earlier, in 1924, he had been prospecting alone near the Toba Inlet, British Columbia, when he was abducted—carried off in his sleeping bag—by a male Sasquatch. Ostman claimed he was held captive by a family of the creatures, whom he described in detail, but escaped after almost a week. However, analysis of his story demonstrated that it was more likely the result of imagination than of recollection (Daegling 2004, 31–32, 67–69).

In 1958, Sasquatch was rechristened after making several visits to a road-construction site at Bluff Creek in remote northern California. The tracks were discovered by Gerald Crew, a photo of whom, holding up a cast of a giant footprint, was picked up by a wire service and circulated across the country. As a result, "Bigfoot" (whose name first appeared with the Crew photo in the *Humboldt Times* on October 5, 1958) began to proliferate. Decades later, after the death of the Bluff Creek road contractor, Ray Wallace, Wallace's family told the press that he had faked the 1958 tracks, and they even produced pairs of carved feet that matched the Bluff Creek tracks (Daegling 2004, 29, 73; Coleman and Clark 1999, 39).

Another watershed came in October 1967 with "one of the most momentous events in the annals of Bigfoot hunting" (Bord and Bord 1982, 80). Roger Patterson, a longtime Bigfoot enthusiast who had frequently "discovered" the creature's tracks, encountered a man-beast as he and a sidekick rode at Bluff Creek. It spooked the men's horses but as his mount fell, Patterson claimed, he jumped clear, grabbed a movie camera from his saddlebag, and filmed the creature as it strode away with a seemingly exaggerated stride, "as if," wrote Daniel Cohen (1982, 17), "a bad actor were trying to simulate a monster's walk."

Patterson's creature had hairy, pendulous breasts, a detail many thought so convincing that it argued against the film being a hoax. Actually, Patterson had previously made a drawing of just such a supposed female creature which appeared in his book, published the year before (Patterson 1966, 111).

Although early in the next millennium a Patterson acquaintance, Bob Heironimus, confessed he had been the man in the ape suit (Long 2004), some skeptics as well as die-hard monster enthusiasts refused to believe him.

Meanwhile, hoaxes and questionable reports aside, the fact remains that no credible capture of Sasquatch/Bigfoot has ever been recorded, nor has anyone ever recovered a carcass or even partial skeleton in the Pacific Northwest or elsewhere. Insists Cohen (1982, 9), "Surely the creatures die." Ah, well, but the *legend* still seems impervious to destruction.

Cadborosaurus

That there are—if not actual "sea serpents"—great denizens of the deep, no one can dispute. Among them are the giant manta ray (frequently twenty feet across), the whale shark (sixty or more feet long), and still other great creatures—including the giant squid and the blue whale (Welfare and Fairley 1980, 68, 71–72).

While there are numerous early accounts of great "sea serpents," often described as having multiple humps, it is usually difficult to theorize about what was actually seen. In one instance it may have been quite ordinary creatures viewed at a distance, or in another simply the product of an overworked imagination or even a deliberate tall tale. The lack of

photographs is one problem, the absence of a single authenticated remnant another.

There are *apparently* such remains, such as the carcass of one that washed ashore in Scotland in 1808 (known as the Stronsa Beast) and another caught in a Japanese fishing net on April 25, 1977 (Welfare and Fairley 1980, 81; Shuker 1996, 210–211). Both of those turned out to be the rotting carcasses of basking sharks. According to *Arthur C. Clarke's Mysterious World*: "The dead basking shark decays in the most deceiving manner. First the jaws, which are attached by only a small piece of flesh, drop off leaving what looks like a small skull and thin serpentlike neck. Then as only the upper half of the tail fin carries the spine, the lower half rots away leaving the lower fins which look like legs." As this source concludes, "Time after time this monsterlike relic has been the cause of a sea serpent 'flap'" (Welfare and Fairley 1980, 81).

Indeed, in the case of the creature hauled up by Japanese fishermen (off the coast of New Zealand), tissue analyses were conducted by Tokyo University biochemist Dr. Shigeru Kimora. These revealed the presence of the protein elastodin, found only in sharks (Shuker 1996, 210). Other such "globsters" (as decomposed sea monsters are dubbed) turn out to be whales, oarfish, or other scientifically known creatures (see Radford 2006).

Despite such a bleak state of affairs, an alleged sea serpent is said to appear from time to time in Cadboro Bay, on the southeast coast of British Columbia's Victoria Island. It was first reported on October 8, 1933, by a barrister, Major W.H. Langley. He was sailing in his sloop *Dorothy* about 1:30 P.M., whereupon he spied a creature "nearly eighty feet long and as wide as the average automobile." Langley said it was greenish brown and had a serrated body, "every bit as big as a whale but entirely different from a whale in many respects." His sighting was reported in the *Victoria Times* by reporter Archie Willis, and a newspaperman from the rival Victoria *Daily Colonist*, Richard L. Pocock, dubbed it "Cadborosaurus" (after its habitat, Cadboro Bay, and the Latin word for "lizard," *saurus*).

Other sightings soon followed, one on November 29, all made newsworthy by interest in reports and photos of the newly "discovered" Loch Ness Monster. Just as "Nessie" made frequent appearances in her northern Scotland home, "Caddy" became a claimed resident of the bay, and by 1950 some five hundred witnesses claimed to have sighted the creature (Colombo 1988, 379–380).

I can attest that Cadboro Bay is picturesque, even at night, but I suspect there is no Cadborosaurus. The many reports and accounts, I learned, "differed in details" (Colombo 1988, 380)—an indication that there may have been various creatures swimming in the waters off Victoria. As I learned in investigating lake monsters (Radford and Nickell 2006, 117–118), multiple creatures—such as otters swimming in a line—can easily be mistaken for a single one appearing to have multiple coils or humps.

Indeed, that may explain one such Caddy sighting, at Roberts Creek, a community overlooking the Strait of Georgia (between Vancouver Island and the British Columbia mainland). It was made in 1932 by local novelist Hubert Evans (1892–1986) who saw "a series of bumps breaking the water, all in dark silhouette, and circled with ripples." He told a friend: "Sea lions. They run in a line like that sometimes." But as they watched, the profile of a head emerged which the two men estimated was extended some six feet out of the water (Colombo 1988, 369–370). However, the creature or creatures were apparently some distance away and could have been misperceived. The story was half a century old when told and related by a rather obvious romantic who gushed, "It just put the hair up on the back of your neck" (Colombo 1988, 370).

Another reported Caddy sighting (so-called, although actually occurring in the San Juan Islands chain) illustrates a similar viewing problem. Terry Graff (2006, 3) reported seeing, in 1997, "what looked like three seals in a row not thirty feet offshore," but then "realized there was only a head on the first one and the second and third were undulating humps moving up and down." I would add, "or so it seemed." Whereas one fellow eyewitness thought it a whale or seal, Graff thought it resembled Ogopogo—actually a purported Pacific Northwest lake monster (Nickell 2006)—stating, "The feeling when you see one is incredible; your mind goes into overdrive trying to classify what your eyes see and the moment you realize that it isn't classifiable is awesome!" All we can really conclude from Graff's account is that viewers were unsure of what they saw.

I got a good idea of just how difficult it can be to know exactly what you are seeing, when on board our cruise ship in Glacier Bay's Tarr Inlet, I had a creature sighting and soon thereafter spoke to a U.S. Park Service ranger about it. She told me it was probably just what I suspected—a sea otter—having actually seen otters at that place and time herself (Cahill 2006).

Two days later, while we were docked at Sitka, Alaska, I went out on a three-hour search—called Sea Otter & Wildlife Quest—aboard the double-decked excursion boat, *St. Eugene*. In addition to "Whale Rock"—a formation located just under water with waves breaking on it that is often mistaken for a whale—I saw a variety of creatures that under the right conditions could simulate a sea serpent. They included a humpback whale, a group of playful sea otters, and harbor seals basking on a little island. These mammals and others, including sea lions, represent much more likely candidates for Caddy than some imagined, hitherto unknown, leviathan.

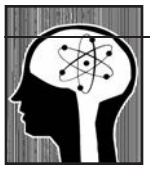
(Part II will discuss aliens and ghosts.)

Acknowledgments

In addition to individuals mentioned in the text, I appreciate the assistance of those who helped make the Alaskan cruise a success, notably Toni Van Pelt and Pat Beauchamp. I am also grateful to Susan Fitzgerald and Jeff Brown of KTOO-FM, Juneau. Also, CFI Libraries Director Timothy Binga once again provided valuable research assistance.

MYSTERIOUS ENTITIES OF THE PACIFIC NORTHWEST, PART I

Continued on page 60



Evolutionary Epistemology, Anyone?

Philosopher Ludwig Wittgenstein famously wrote (in the *Tractatus*) that "Darwin's theory has no more to do with philosophy than any other hypothesis in natural science." Apparently, Darwin begged to differ, since already in 1838, in his Notebook M, he wrote: "Plato . . . says in his *Phaedo* that our 'necessary ideas' arise from the preexistence of the soul, are not derived from experience—read monkeys for preexistence."

The contrast between these eminent thinkers sets the stage for a fascinating treatment of so-called "evolutionary epistemology" by Gerhard Vollmer (in *Darwinism & Philosophy*, edited by V. Hosel and C. Illies for the University of Notre Dame Press, 2005). The basic idea is that evolutionary theory can account, at least in principle, for the very fact that we are capable of (imperfectly) knowing the real world—something that has otherwise baffled epistemologists since Plato. With a simple move, as Vollmer points out, Darwin substitutes a scientific concept (common descent) for a metaphysical one (preexistence), thus ushering in a whole new way of looking at human knowledge.

Evolutionary epistemology aims to explain not only why we can know about the world, but—perhaps more crucially—why our epistemic access to the world is so limited. After all, natural selection adapted our sensory and cognitive abilities to the so-called "mesoworld," that is that portion of reality above the microscopic and quantum levels but below the macroscopic levels of interplanetary to intergalactic phenomena. This means that one should expect our intuitions and reasoning abilities to be pretty good when they address the mesoworld, but to increasingly fail or mislead us when we move away from it. As Vollmer puts it, nobody can visualize the quantum realm, and—ironically enough—many people still have trouble accepting the idea of evolution itself because they cannot wrap their minds around the concept of cumulative change over periods of hundreds of millions of years.

Indeed, even within the meso-realm, we can still be taken in by optical illusions, or draw false inferences, a fact for which classical epistemology has no explanation other than the imperfection of being human (which is simply relabeling the problem, unless one provides an account for such imperfection). According to evolutionary epistemologists, on the other hand, partial cognitive success at the meso-level is the result of the fact that natural selection is notoriously a "satisficying," not an optimizing, process. Selection does not work for the good of the species, nor for the achievement of solutions that are optimal from an engineering perspective. All it does is favor organisms that are even slightly better adapted to the environment than others. Our limited and faulty cognitive and sensorial abilities are good enough for the task of survival and reproduction, and that's all we can expect natural selection to achieve.

Of course, all of this immediately raises the obvious objection: how do we know that evolutionary epistemology is a good account of the range of humanity's epistemic access to the world? Clearly this is a philosophical, not a scientific, problem, so one cannot simply devise a set of controlled experiments to settle the matter. However, there are some good arguments to counter the major objections raised against evolutionary epistemology. Vollmer goes into some details, but essentially the objections boil down to three points. First, evolutionary epistemology assumes what is commonly referred to as a "correspondence theory" of truth, the idea that we get closer to the truth the more our models of the world correspond to how the world really is. Ah, but—unless we are gods—how do we know how the world *really* is? We

EVOLUTIONARY EPISTEMOLOGY, ANYONE?
Continued on page 27

Massimo Pigliucci is a professor of evolutionary biology and philosophy at Stony Brook University on Long Island, a fellow of the American Association for the Advancement of Science, and author of Denying Evolution: Creationism, Scientism and the Nature of Science. *His essays can be found at www.rationallyspeaking.org.*

The Devious Art of Improvising, Lesson Two

Harry Houdini, discussing fraud detection, once wrote in his book *A Magician Among the Spirits* that, "It is manifestly impossible to detect and duplicate all the feats attributed to fraudulent mediums who do not scruple at outraging propriety and even decency to gain their ends. . . . Again, many of the effects produced by them are impulsive, spasmodic, done on the spur of the moment, inspired or promoted by attending circumstances, and could not be duplicated by themselves."

In my previous article, I detailed my initiation, through James Randi, to the art of creating irreproducible feats by "impulsive, spasmodic" and "on the spur of the moment" techniques.

The first time I put to practice what I had learned came very soon after that episode. I had been invited on a late night talk show to discuss psychic phenomena and paranormal claims. The host of the show, Italian political commentator Giuliano Ferrara, asked me if I could do something to show how it is possible to obtain seemingly paranormal phenomena through trickery.

"However," he specified, "I am not going to be a stooge or help you with any trick. If you say you are able to demonstrate something that is indistinguishable from a psychic demonstration, then you should do it without my help."

Massimo Polidoro is an investigator of the paranormal, author, lecturer, and co-founder and head of CICAP, the Italian skeptics group. His Web site is www.massimopolidoro.com.

I said that was fair enough, and suggested he make a drawing on a piece of paper and then I would try to duplicate it live on the show.

"Great!" he said. I was ready.

Or so I thought.

Taking the Chance

I had learned through various books on magic and mentalism many ways of duplicating a drawing done by someone who is hiding it. You can look at the movement of the pencil above the paper and guess the shape he is creating. In some cases, you can even guess a shape just by listening to the sound of the pen on the paper. Or you can look at the impression left by the tip of the pen on the piece of paper below the one being drawn. Or you could try to take a peek between your fingers while you pretend to cover your eyes. Or you could have an accomplice strolling around and taking a look at the drawing on your behalf. Or, as Randi did in Rome, you can switch an envelope . . . and so on.

Ferrara, however, took a single sheet of paper, asked me to turn my back to him and made his drawing very quickly, leaving me no chance to use some of the ruses I was ready to put in practice.

When I turned around, he had already folded his sheet of paper and placed it inside his jacket pocket. He used no envelopes.

"Good" I said, while I was actually thinking: "Bad. Really bad!" I had not been able to stay in charge of the situation and had let him take charge and make the rules.

A fatal mistake.

"Well, I will see you later on the show" he added, in fact, waving me goodbye.

"Oh no!" I thought. "This can't happen! He can't leave: I have no idea what he drew!"

And this is where Randi's lesson on improvising suddenly struck me. An idea popped into my mind.

"Right . . . ehm, Mr. Ferrara, I just thought something. . . ."

"What is it?"

"Well, did you make your drawing with a pen or a pencil?"

"With a pencil, why?"

"Ah! You see, I think that if you hold up a white sheet of paper to the camera with a drawing done in pencil, it will be very hard for the viewers to see what you drew. . . ."

He thought about it for a few seconds, and then agreed. "You are right! Here . . ." he said taking another piece of paper. This time, he used a felt tip marker and did another drawing.

When he was done, he put the new drawing in his pocket and *took the other drawing, crumpled it up and threw it in a waste paper basket!*

And then he left.

Well, I thought. Now, this is very interesting. . . .

For some inexplicable reason, the papers I was holding suddenly fell on the floor and I had to kneel down in order to collect them. When I stood up I had a crumpled up piece of paper hidden between my documents.

I immediately went to my dressing room and opened up the paper. There was a real risk in all this: Ferrara may have well decided to do a different drawing the second time. However, when I saw what he drew I knew for sure that he had not changed his mind, for he had drawn a hammer and sickle. Since Ferrara had been a left-wing supporter for years but had just recently adopted a conservative position, I thought that by drawing the symbol of the Communist party he was planning to make a joke of some kind while on air.

And, in fact, this is exactly what happened. During the show, after some deep concentration, I drew a hammer and a sickle and he showed to the audience that it was exactly what he had drawn.

It is true that luck played an important part in all this, but as the saying goes, fortune helps the daring.

But this is not always the case, and this is exactly what happened to Randi in a memorable television appearance some years ago.

The Belly Writer

Randi told me he had been invited by Barbara Walters to appear on her television show *Not for Women Only*. She had already had Uri Geller as a guest a few months earlier and he had worked wonders on her: she had become a believer.

When the time came for an episode of the show devoted to "Magic and Magicians," Walters invited three very prominent magicians of the time: Doug Henning, then star of Broadway's "The Magic Show," Mark Wilson, one of the first TV magicians, and Randi himself.

During the show, the discussion turned to Uri Geller and to an incredible telepathy test he had done for her. He had divined what drawing Barbara had drawn and had hidden inside three envelopes and then kept inside a book. She wanted to see if Randi was up to his claim that he could reproduce everything that Geller did, so she said: "Just before the program, I did a drawing. I put it in three envelopes in this book. We have not had this envelope out of our sight. Randi has in no way been close to it. The closest you've been to it, to my knowledge, is right now. Reproduce it."

"Now," Randi explained to me, "her words were totally true. I never ever had a chance to get close to the drawing, as hard as I tried. I doubt they used the same strict conditions on Geller, but the fact remains that that was the very first time I saw the envelope."

So, without blinking, Randi acted as if everything was going perfectly. "Please put it back in the book. I want to be sure it's under control."

She obeyed and then Randi turned to his fellow magicians. "Now watch this, it may surprise you."

Both Henning and Wilson were staring, quite curious to see how Randi would escape from such an impossible situation.

Both Henning and Wilson were staring, quite curious to see how Randi would escape from such an impossible situation.

Randi took out a pen and started to draw something on a piece of paper, without showing it to anyone. When he was done he put the drawing, face down, on the table. Put the cap back on the pen and put the pen on the table. "Now let's see your drawing" he asked Walters.

She was already seeing her illusions go down the drain, because Randi's confidence was so powerful that it could mean only one thing: somehow he had reproduced the drawing correctly.

"Oh no, I can't believe it" she said even before she had seen Randi's guess.

Walters took the envelope out of the book. She opened one envelope, opened the second, and when she was ready to open the third, Randi stopped her to ask if her drawing could be seen through it. She checked, but it could not be seen.

The final envelope was opened and the drawing shown: it was a house with a little girl standing outside, a chimney, smoke coming therefrom, and a doorway. Randi turned his drawing to the camera. It was a bit crude in style, but it showed exactly the same thing, the house, the smoke and the little girl (standing inside, rather than outside).

Both the magicians and Walters agreed that Randi truly was amazing.

Now, how did he do it? Randi had described this demonstration in his book *The Truth About Uri Geller* but had never revealed it in print. So, when he showed me the tape a few years ago, I immediately asked him about it.

"During the show, while Barbara was talking or we were watching some footage on Geller, I surreptitiously opened the pen and took out the cartridge from it. Then, I closed the pen again and put it on the table. I then inserted the cartridge in my belt, with the writing side upward. Now it was just a question of acting. I mimed the action of drawing, with the non-writing pen, and put the blank paper face down. When she started to open the envelopes, I could see through the last one a bit of the drawing, I saw a house and a stylized girl. So I took the paper again with both hands, and asked her to check if the envelope was transparent. It was just an excuse to gain some time for me to draw, as best as I could given the situation, a replica of her drawing. I simply placed the paper against the tip of the cartridge and started to slowly move my belly in order to make the drawing. Yes, the final product was not perfect, but the result I got from her reaction was fantastic, and that is all that matters. To the viewers, and to my fellow magicians, I was able to reproduce exactly what Geller had done, even though the conditions had been quite bad for me!"

If I thought that Randi had topped himself with this ingenious system he had invented on the spur of the moment, just out of desperation as he admitted to me, I was wrong. Next time, we will see why. . . . □

The Flashlight of the Gods

Now that crashed saucers seem to have replaced alien abductions as the "gold standard" of UFOlogical excitement, there is something of a "gold rush" to promote additional crash sites. Already well-established are the legendary Roswell, New Mexico, crash of 1947, and the Kecksburg, Pennsylvania, crash of 1965 (actually the Great Lakes Fireball of December 9, 1965—see this column, May/June, 2004).

One up-and-coming entrant in the UFO Crash Derby is the tiny town of Aztec in northwest New Mexico, not far from Four Corners. The Aztec crash yarn began with entertainment columnist Frank Scully's 1950 book *Behind the Flying Saucers.* Among its many dubious claims was that a saucer 99.99 feet in diameter (the saucers allegedly followed "the rule of Nines," when measured in multiples of a long-dead British monarch's foot) crashed in Hart Canyon, containing the bodies of sixteen little men, dressed in the clothing styles of 1890. Scully's book generated a lot of publicity and interest, which abruptly faded when his chief informant, Silas Newton, was convicted as a swindler.

But sunken UFO stories, like rubber duckies, have an amazing propensity for popping up to the surface again and again. Recently Stanton Friedman, the "flying saucer physicist," wrote, "Years ago I was indeed dubious about the Aztec case, thanks to Bill Steinman, Silas Newton, etc., etc. However, once I did my homework, visited the site, and spent time with Scott Ramsey and others who have been doing theirs, I became convinced that indeed a saucer crashed at Hart Canyon near Aztec in March, 1948, and its retrieval was indeed, as one might expect, covered up by the U.S. Government. Scott has really dug into the documentation, and found witnesses, etc. I would probably still rank Roswell the number one crash" (*Saucer Smear,* May 1, 2006). An annual UFO symposium has been held in Aztec since 1998 (the Web site claims "of the sixteen recovered "crashed disks," twelve were recovered in New Mexico alone"—see www.aztecufo.com). Given that there is little other reason for anyone to visit the tiny town, its semi-famous UFO crash site has obviously become one of Aztec's greatest assets.

Perhaps sensing a profitable venture, some folks are working hard to rehabilitate the once-infamous (and now virtually forgotten) alleged UFO crash at Carbondale, Pennsylvania. On the night of November 9, 1974, three teenage boys reportedly heard a noise in the sky, then looked up to see a red ball of light coming at them from over a nearby mountain. They claimed it plunged into a small pond, from whose depths a light could be seen glowing faintly. The authorities were notified, and thus began a two-day vigil next at the water's edge. Finally, after Geiger counter readings showed that the pond was not radioactive, a determined diver named Mark Stamey braved the depths and soon returned with an amazing find: a battery-powered railroad lantern. It was never determined who had thrown it into the pond.

Aah, but more than thirty years later, "the truth" is coming out: According to BUFO, the Burlington UFO Internet Radio, "the 'lantern story' was a coverup for something much bigger—something that our government did not want us to know about." Diver Stamey is now claiming that the lantern incident was "staged," and a UFO remained in the water's depths. If you want to get the lowdown on the great Carbondale UFO Crash, see www.burlingtonnews.net/carbondale.html. BUFO claims to be the highest-ranked Internet radio site for UFOs and paranormal subjects.

However, repetitive UFO fatigue seems to be settling in to even the most well-established UFOlogical activities. Attendance at this year's annual Roswell UFO Festival was "pathetically low" according to UFOlogist Dennis Balthaser; no official numbers were released. The organizers blamed the decline in attendance on the high price of gasoline. Nonetheless, the city of Roswell is taking over sponsorship for

Robert Sheaffer's World Wide Web page for UFOs and other skeptical subjects is at www.debunker.com.

next year's festival. The National UFO Conference, originally scheduled to take place in Hollywood during the Labor Day weekend, was unexpectedly cancelled; as of this writing the organizers, battling the calendar, hope to hold a last-minute UFO conference in December in San Diego.

However, what we are witnessing does *not* appear to be the demise of belief in UFOs and related claptrap. Instead, it is gradually transforming itself from a participatory activity to a spectator sport, in keeping with larger social trends that are turning many people into couch potatoes. The Science Fiction Channel has announced a new weekly series, *Sci Fi Investigates,* promising to look into such worthwhile subjects as life after death, Mothman, voodoo, Roswell, paranormal hotspots and Bigfoot. The era of the individual UFO sighting, membership in UFO clubs, and attending paranormal conferences is fading away. Even UFO magazines and most books on the subject are now irrelevant. Taking their place is what seems to be practically the all-paranormal, all-the-time programming on certain cable TV channels, where exciting state-of-the-art visual effects give undeserved credibility to the same old tired and unsubstantiated claims. Just as the cable news channels talk endlessly about news developments on which they have little or no real information, the History and Science Fiction Channels (among others) now endlessly re-hash and re-re-hash featherweight UFO claims to titillate the masses. UFOs are alive and well, except they're not seen in the skies any more. You'll find them zooming in on digital cable to your new plasma flat-screen HDTV.

* * *

Some "mysteries" aren't all that hard to solve; indeed, they make you wonder how they ever qualified as a "mystery" in the first place. The mystery-mongering late night talk show *Coast to Coast AM* featured on its Web site an account called "The Message on a Microwave Clock." Listener Scott F. writes, "On a weekend in March of this year something strange happened again with our microwave as it had about three months prior. My brother was heating his meal in the microwave and moved toward it when it was finished. He then noticed that the digital clock on the microwave spelt the word *child*. This had happened one time late in 2005 with exactly the same word on the same microwave. That time, we were so creeped out by it that we immediately pressed the button to clear; it required several attempts before the word was removed and the time was displayed again as usual . . . there have not been any other strange occurrences here. Additionally, there are not any children in my family or neighborhood that have passed on within my lifetime." But the Webmaster added the following "update" at the bottom of the page: "Many listeners have pointed out that this message indicates the microwave's 'Child Lock' feature is enabled." Of course, this doesn't mean that the *next* strange message displayed on a microwave clock won't be supernatural. . . . □

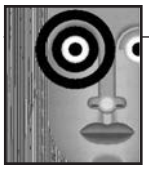
EVOLUTIONARY EPISTEMOLOGY, ANYONE?
Continued from page 23

don't, at least not directly. Then again, it would be pretty astonishing if our theories made very precise predictions about the behavior of the world (consider, for example, quantum mechanics) and still turned out to be completely wrong. As philosopher Hilary Putnam (cited in Vollmer) once quipped, "The typical realist argument against Idealism [a major philosophical foe of evolutionary epistemology] is that it makes the success of science a miracle."

A second major objection to evolutionary epistemology is based on the idea that it isn't actually possible to show that our cognitive structures are fit to their environment without entering into a vicious circle (after all, we would have to use precisely those cognitive structures to check the fit . . .). Science gets us out of the quandary here. While it is true that ultimately all our knowledge has to derive from our senses and reasoning abilities, it is also true that science has augmented our tools to explore the world, and has objectified our ability to do so. Consider particle accelerators, whose data are gathered by machines, not humans, and are analyzed by computers, not neuronal circuits. While the results of subatomic physics (or any other science) are obviously not entirely independent of human faculties, they are partially detached from them, which makes a test of the reliability of human faculties possible (consider the simpler, but related, issue of how we establish if someone is seeing a mirage rather than a real object).

A final objection to evolutionary epistemology, according to Vollmer, asks how our cognitive structures can be adapted to an environment that wasn't known to the organisms in question (i.e., us). This betrays a fundamental misunderstanding of the theory of evolution: the process of adaptation by natural selection is best understood as a continuous feedback between the genetic makeup of an organism and the environments in which the organism lives. No prediction of the future is required because selection constantly adjusts the fit of the organism to whatever environmental changes happen to take place. In much the same way, we don't need a thermostat to *predict* changes in temperature in order to maintain a comfortable environment in our houses. (Interestingly, a thermostat does inevitably cause a delay in such adjustment, precisely because of the lack of predictive power; an analogous partial lack of fit between organisms and environments has also been demonstrated by evolutionary biologists.)

Evolutionary epistemology may not have all the answers, of course, but it is an excellent example of how science can inform philosophy, contrary to Wittgenstein's smug comment in the *Tractatus*. It seems that just as there can be no science without philosophical assumptions, there can hardly be philosophy without accounting for the findings of science. □



Soul Scales

Q: Have you heard about the claim that a person's soul can be weighed? A friend told me that this is based on a scientific experiment, but I'm not sure.

M. Bennett

A: People have searched for evidence of life after death for centuries, if not millennia. Spiritualists, psychic mediums, and most religions teach that death is not an end but instead a moment of transformation when a person's soul or spirit is cleaved from its decaying corpus and freed to go on to a higher or better place.

It is an appealing idea and a beautiful metaphor. But is it true? Does a spirit have material weight? Does a soul have mass? Has science found the soul?

Yes—so the story goes—such experiments have taken place; doctors and researchers determined that the soul weighs twenty-one grams. This of course brings up all sorts of interesting questions. Do devout people have heavier souls? Since death is not necessarily a discrete point but part of a continuum, does a person weigh less and less the closer to death he or she is? Do children have more soul than the elderly? If the soul has mass then it must be material; what's it made of? Pungent ether? Minty, mystic mist? Is it a small, squishy ball that resembles rabbit droppings, or a clear purple ooze that smells like bubble gum? What exactly is it?

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People often look to the empirical world to bolster their religious or spiritual beliefs, searching for corroborating physical evidence that their beliefs are based on fact. (I once won a bet from a fundamentalist Christian coworker who insisted that men have one fewer rib than women, evidence that God used one of Adam's ribs to create Eve.) The idea that a soul can be measured is appealing on many levels, especially since it provides empirical evidence of the soul's mass.

Welcome to the oft-visited (in paranormal circles, anyway) realm of irreproducible results. In 1907 a Massachusetts doctor named Duncan MacDougall of Haverhill, Massachusetts, devised a series of experiments that he expected would measure the soul. Using six terminally ill patients on a specially constructed scale bed, he measured their weight before, during, and after death. His results were mixed, but he concluded that there was indeed a very slight loss of weight, on average twenty-one grams. When he repeated this test on (presumably soulless) animals, he found no such weight reduction. After eliminating the possible sources of error for this startling finding (such as the loss of air from the lungs), MacDougall concluded that he had finally quantified the weight of the soul.

MacDougall's efforts are a good example of pseudoscience. On the face of it, the experiments seem fairly straightforward (either a body weighs less just after death or it doesn't), but a closer look reveals varied and profound flaws in his methodology. For one thing, MacDougall used a very small sample size, and his results were inconsistent; some bodies lost more than an ounce, others far less. As myth debunker Barbara Mikkelson concluded, "out of six tests, two had to be discarded, one showed an immediate drop in weight (and nothing more), two showed an immediate drop in weight which increased with the passage of time, and one showed an immediate drop in weight which reversed itself but later recurred." Furthermore, the precise moment of death is not always clear even today, and in 1907 medical measurement methods were even cruder. (Readers interested in the process of dying should seek out Alan King's brilliant and moving 2003 documentary *Dying at Grace*.)

With tighter protocols and better diagnostic tools, if the soul does indeed exist, and does indeed have a measurable weight, then science should be able to verify it. MacDougall died in 1920, and in the century since his first experiments, no one has reproduced his results. Just as MacDougall's name has been stripped from his findings, so have the fatal design errors in his work. All that remains is the easily remembered "fact" that the soul weighs twenty-one grams. And like the oft-debunked factoid that people only use ten percent of their brains, the belief that the soul has weight will likely live on.

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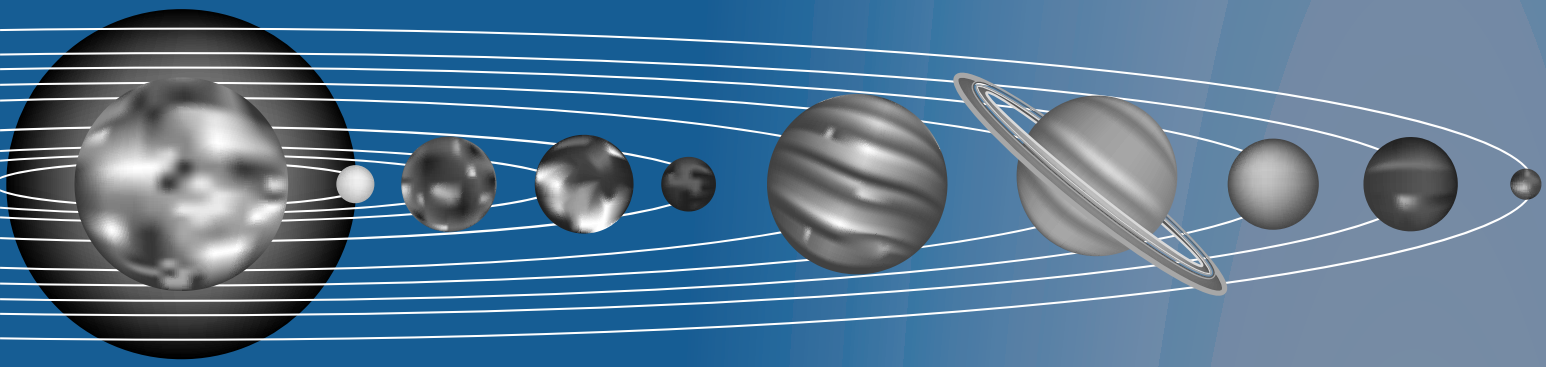


Man for the Cosmos:
Carl Sagan's Life and Legacy as Scientist, Teacher, and Skeptic

In this new remembrance of Carl Sagan, who died ten years ago, a noted planetary scientist and colleague (and former student of Sagan) recalls Sagan's immense contributions to planetary research, the public understanding of science, and the skeptical movement.

DAVID MORRISON

Carl Sagan was the world's best-known scientist in the late twentieth century, serving as our guide to the planets during the golden age of solar system exploration. He was both a visionary and a committed defender of rational scientific thinking. Sagan died on December 20, 1996, while only 62, and he has been greatly missed in the decade since. In addition to my own knowledge and insights about his scientific and skeptical contributions, I have made extensive use of the two excellent narrative biographies by William Poundstone (1999) and Keay Davidson (1999). Poundstone is stronger on Sagan's science, Davidson on his personal history. Neither, however, emphasizes his role as a skeptic.

Sagan was propelled on his academic and public careers by enormous talent, good luck, and an intensely focused drive to succeed. His lifelong quest was to understand the universe, especially our planetary system, and to communicate the thrill of scientific discovery to others. A natural teacher, he loved to explain things and never made a questioner feel stupid for asking. Although Sagan had broad intellectual interests, his pursuit of his career left little time for other activities: he did not play golf or follow sports, take up cooking or photography, sing or play a musical instrument, or join a church or synagogue. His first two wives complained that he devoted insufficient time to his marriages or his children (Davidson 1999). He focused on his career goals, and the world was enriched thereby.

As Sagan often noted, only one generation was privileged to grow up when the planets and their moons were little more than dim points of light in the night sky, and to see them emerge as unique worlds with their own geological and perhaps even biological history.

Many scientists would like to be able to communicate with the public about their discoveries. However, few become adept at explaining technical subjects in terms that are readily understood by the lay public. Even fewer are willing to take the time to answer journalists' questions patiently, to sit still for application of makeup for television appearances, or to return reporters' calls promptly even when they interrupt a meal or a lab experiment. They might like to be great communicators, but they lack the skills and the commitment. They also recognize that academic rewards generally come to the best researchers, with limited honor associated with excellence in teaching and even less for public outreach. Sagan was different. He recognized his talents as a teacher and popularizer and decided to make such outreach a major aspect of his career.

Born in 1934, Sagan grew up in a working-class Jewish neighborhood of New York and attended urban public schools in New York and New Jersey. The University of Chicago provided him scholarship support when he entered in 1951, and he continued there for graduate work, receiving his doctorate in astronomy in 1960. After two years as a postdoctoral fellow in biology at Berkeley and Stanford, he joined the Harvard College astronomy faculty as Assistant Professor. Denied tenure at Harvard, Sagan moved to Cornell University in 1968, serving as David Duncan Professor of Astronomy and Director of the Laboratory for Planetary studies until his death in 1996.

Astrobiologist David Morrison (NASA Astrobiology Institute), a Fellow of CSI, was one of Sagan's first doctoral students. He wrote a scientific update for the reprinting of Sagan's The Cosmic Connection*, and he was recently awarded the Carl Sagan Medal of the American Astronomical Society for his contributions to the public understanding of science.*

Research

Although best known to the public as a popularizer, Sagan first distinguished himself as a research scientist. His accomplishments in research made it much easier for his academic peers to accept him as a spokesperson for science. Sagan loved the research process, especially when it was combined with the exploration of new worlds. As he often noted, only one generation was privileged to grow up when the planets and their moons were little more than dim points of light in the night sky, and to see them emerge as unique worlds with their own geological and perhaps even biological history. Sagan helped define two new disciplines: planetary science and exobiology. As a leading consultant to NASA, he also helped chart the exploration of the solar system by spacecraft.

With training in both astronomy and biology, Sagan brought a unique breadth to the emerging new fields of planetary science and exobiology. At the time he received his doctorate, his thesis advisor Gerard Kuiper recognized that "Some persons work best in specializing on a major program in the laboratory; others are best in liaison between sciences. Dr. Sagan belongs in the latter group" (in Davidson 1999).

Sagan was an "idea person" and a master of intuitive physical arguments and "back of the envelope" calculations. He usually left the details to others, and most of his published papers were collaborations. Much of this work was done with students, many of whom went on to become leaders themselves in planetary science. On much of his later work, including the famous TTAPS paper on nuclear winter (more on this later), his name appears last among the listed authors. Throughout the 1970s and into the 1980s, he also edited the foremost professional journal in planetary science, *Icarus*.

Sagan's most important early research dealt with the atmosphere of Venus. Discoveries in radio astronomy made when he was in graduate school first suggested that this planet had a very hot surface, in contrast to previous speculation that the climate of Venus was more Earth-like. Part of Sagan's thesis consisted of the first computed greenhouse model for the atmosphere, in which the high infrared opacity of carbon dioxide and water vapor produced a surface temperature hundreds of degrees higher than that of an airless planet. Over the decade of the 1960s he improved these models, working primarily with his former student James Pollack, to develop and refine what remains to this day our basic understanding of the atmosphere of Venus.

Mars was another planet that interested Sagan, and with Pollack he modeled the atmosphere and developed the idea, later verified by the Mariner 9 and Viking spacecraft, that quasi-seasonal changes observed on the surface were the result of wind-blown dust. He also wrote a series of papers on Jupiter, focused on atmospheric organic chemistry.

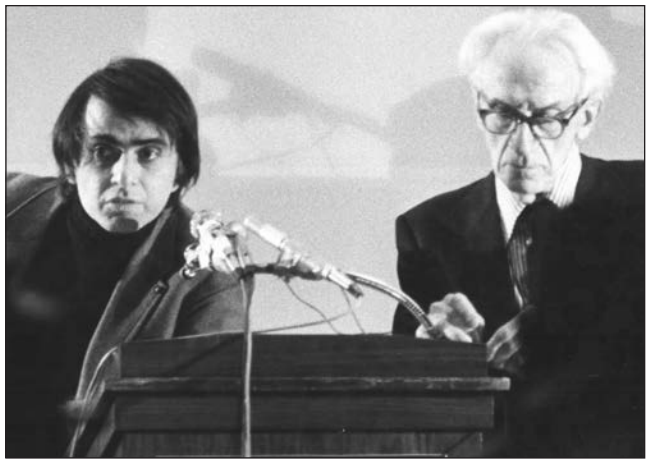
From childhood, Sagan had been inspired by the mystery of the origin and distribution of life. This passion led him to study biology and develop collaborations with leading biologists such as Stanley Miller, and Nobel laureates Joshua Lederberg and George Muller. Early in his career, he received more encouragement from these biologists than from astronomers, many of whom considered planetary studies to lie on the fringes of respectable science, and exobiology to be beyond the pale. A number of his early publications were in exobiology, and at various times he speculated about life not only on Mars, but also on Venus, Jupiter, and even the Moon. In spite of his increasing role as a scientific skeptic, he permitted himself to indulge in this broad speculation, so long as his ideas remained within the realm of possibility. Sagan was also one of the founders of international interest in SETI, the microwave search for extraterrestrial intelligence, although he himself did not conduct any searches.

NASA valued Sagan's contributions to the spacecraft exploration of the planets during its "Golden Age" (roughly 1960–1990). He was a member of science teams selected for the Mariner 2, Mariner 9, Viking, Voyager, and Galileo missions, among others. With his quick mind and breadth of vision, he was always a welcome contributor to planning sessions and the "quick look" interpretation that followed the first receipt of spacecraft data. His former student Clark Chapman wrote in 1977: "A man of vivid imagination, he keeps alive a wide variety of conceptions of planetary environments. By suggesting often outlandish alternatives and challenging traditionalists to disprove them, he has inspired doubts about many accepted theories. Sagan's role is essential for healthy science because a bandwagon effect frequently leads to premature consensus among scientists before equally plausible alternatives have even been thought of, let alone rationally rejected."

Sagan's own excitement with the process of scientific discovery is captured in the following quote (Sagan 1973): "Even today, there are moments when what I do seems to me like an improbable, if unusually pleasant dream: to be involved in the exploration of Venus, Mars, Jupiter, and Saturn; to try to duplicate the steps that led to the origin of life on an Earth very different from the one we know; to land instruments on Mars to search there for life; and perhaps to be engaged in a serious effort to communicate with other intelligent beings, if such there be, out there in the dark of the night sky."

Popularizer and Skeptic

At the same time he was building up an enviable bibliography (which grew to 250 pages by the end of his life) and a record of successful students, Sagan also established a growing reputation as a popularizer of science. His boyish good looks, resonant voice, and ability to explain scientific concepts in ways



Carl Sagan with Immanuel Velikovsky at the 1974 AAAS debate. All photos by David Morrison.

that lay persons and students could understand made him a popular teacher and public lecturer. He won teaching awards at Harvard and Cornell, and even in the busiest times of his life he tried to keep his hand in undergraduate teaching.

In 1966 he first achieved some modest national attention with his book (with the Russian astronomer I. S. Shklovskii) *Intelligent Life in the Universe*. The following year, Sagan wrote an upbeat article on the potential of life on the planets for *National Geographic*, and he made a few brief TV appearances. Already it was apparent to some that Sagan sought a broader role than that of academic researcher, a concern that probably contributed to denial of tenure by Harvard University in 1967. Students loved him, but some colleagues bristled at what they perceived as self-aggrandizement and pandering to the public. Unlike Harvard, Cornell University was looking for faculty with a potential for stardom, and they provided Sagan an endowed chair and the solid academic springboard he needed for his future rise to fame and fortune.

Throughout his career, Sagan devoted himself to the quest to improve public understanding of the nature of science. He wanted every citizen to have a "baloney detector" as defense against sham in commerce and politics as well as science. He felt that it was the duty of scientists to face these issues squarely and publicly. *The Cosmic Connection* (1973), which includes extensive discussions of extraterrestrial life as well as more conventional astronomy and planetary science, even explores the UFO phenomenon and the writings of pseudocosmologist Immanuel Velikovsky. However, Sagan opposed tactics that demeaned pseudoscientific beliefs or attacked religion, refusing (for example) to sign a statement against astrology because of its authoritative tone.

His interest in popular misconceptions about science led him to organize two public symposia on fringe-science topics at meetings of the American Association for the Advancement of Science (AAAS). Both arguably concerned real scientific issues, not cases of fraud or religious extremism.

The first AAAS symposium, in 1969, dealt with the reality of UFOs. Like many scientists of his generation, in high school Sagan had been attracted to the idea that UFOs might

Sagan with colleague Toby Owen at JPL in 1976, examining recent Viking orbiter photos of Mars. Sagan and Owen played key roles in deciding on the landing sites for the Viking spacecraft.

be visiting spacecraft. At the AAAS, J. Allen Hynek and James McDonald defended UFO studies while Sagan, Donald Menzel, and Lester Grinspoon attacked this position. The proponents on both sides of the issue were scientists, although they took very different approaches to the interpretation of the anecdotal reports of UFO sightings. (The subject of alien abductions or direct contact with extraterrestrials, which has since become so common, was not an issue at that time; the AAAS symposium focused on the interpretation of moving lights in the sky and anomalous radar signals.)

UFO proponents argued that even though there was no individual sighting in which one could make a compelling case for extraterrestrial spacecraft, the sheer volume of reports justified continuing examination and study. In contrast, Sagan emphasized the unreliability of witnesses, the absence of physical evidence of UFOs, and alternative explanations including hallucination and self-delusion. He noted that "there are no cases that are simultaneously very reliable (reported independently by a large number of witnesses) and very exotic (not explicable in terms of reasonably postulated phenomena)," and he applied a skeptical standard that is often associated with his name: that extraordinary claims require extraordinary levels of evidence or proof.

The 1974 AAAS symposium, on the work of Velikovsky, was riskier, since Velikovsky himself was invited to speak under AAAS sponsorship, something he claimed as a vindication. While Sagan promoted the symposium, it was actually organized by historian Owen Gingerich and astronomers Ivan King and Donald Goldsmith. Velikovsky's thesis of global catastrophes caused by numerous planetary encounters within historical times was scientifically indefensible but had attracted a wide popular following. Unlike the UFO symposium, there were no scientists to defend these ideas, published in his 1950 book *Worlds in Collision* (dismissed by Sagan [1973] as a "speculative romance"). Rather, the 77-year-old Velikovsky confronted his debunkers personally.

Keay Davidson (1999) describes the symposium as part apology to Velikovsky for previous slights from astronomers, and part an effort to reassure the public of science's basic fair-mindedness. The confrontation of the patriarchal Velikovsky and his young, brash critic was a clash of egos on both sides. Sagan aimed his remarks, published in extended form in *Scientists Confront Velikovsky* (Goldsmith 1977), primarily at the public and science journalists. By most accounts he was the hands-down winner. Many people credit this debate as the beginning of the end for the Velikovsky cult, which is today reduced to a handful of obscure cranks.

However, Sagan's role earned him the bitter enmity of Velikovsky supporters. His greatest sin was his lack of respect for the old man, who steadfastly refused to accept any modification of his then quarter-century-old views. Sagan's critique of *Worlds in Collision* was also castigated by Velikovsky followers for its failure to address all of his claims, and for some slipshod calculations that were never corrected in Sagan's published remarks. This symposium has been extensively analyzed (e.g., Bauer 1984), and it still raises unanswered questions about the most effective ways to counter pseudoscientists. Similar scenarios are replayed today by scientists who debate creationists and defenders of intelligent design. I sometimes ask myself if Sagan would have ventured into this lion's den, and if so how a debate between him and, say, creationist Duane Gish, would have played out.

Both AAAS symposia were widely covered by the media and contributed to a growing public recognition. A further boost came in 1973 with the publication of *The Cosmic Connection*, described in *Science* (Hartmann 1974) as "thirty-nine genuine, vintage Sagan dinner conversations." This description was more accurate than the reviewer may have realized. This book, like all of Sagan's, was dictated. Creating his books and popular articles this way, Sagan simultaneously developed his unique speaking and writing styles. At his lectures, listeners were impressed by his carefully crafted sentences, and by the way his talks (delivered without notes) seemed to be so well organized. Dictation turned out to be the perfect way for Sagan to organize his thoughts and develop his prose style simultaneously. It allowed him to "write" while traveling or walking on the beach, and it never necessitated his learning to type. It also allowed him to derive multiple value from the same material, typically delivering his message in various lectures, writing it for a magazine article (for such outlets as *Parade*), and using it as the basis for a chapter in one of his books.

The Cosmic Connection helped open the door to a medium that Sagan seemed destined for: television. In November 1973, he was invited to appear on the popular *Tonight Show* with Johnny Carson (himself a skeptic). Handsome, articulate, informal in manner, yet enthusiastically discussing real science (and often bringing the latest photos from NASA missions like Viking and Voyager), he captivated both the audience and the host. Over the following thirteen years, Sagan appeared on *The Tonight Show* twenty-six times. No matter how pressing his other business, he was always willing to take a break and fly to Hollywood for Carson. He considered it "the biggest classroom in history."

In January 1974, *Time* did a cover story on life in the universe, in which it called Sagan "the prime advocate and perennial gadfly for planetary exploration." A few weeks later Sagan

published an article in *TV Guide*, the largest circulation magazine in the United States. Sagan was suddenly hot, receiving media attention normally reserved for a select few Nobel Prize winners. In August 1976, *Newsweek* put his smiling face on its cover, a rare accolade for any scientist. Their thumbnail sketch stated: "At 42, Carl Sagan has become the leading spokesman and salesman for the new science of exobiology, the search for extraterrestrial life. Lobbying in Washington, appearing on television talk shows, and teaching at Cornell, he is building fresh support for the space program and fulfilling his own fantasies of finding life out there." Two years later, he received the ultimate tribute for a science writer, winning the 1978 Pulitzer Prize for general nonfiction for his book about the human brain, *The Dragons of Eden*.

Sagan was a founding member of the Committee for Scientific Investigation of Claims of the Paranormal. CSICOP originated in 1976 in part to direct attention to egregious media exploitation of supposed paranormal wonders. (He was always supportive of CSICOP and the SKEPTICAL INQUIRER, and served as keynote speaker at two well-attended CSICOP conferences, Pasadena in 1987, Seattle in 1994, each of which led to a major article in SI: "The Burden of Skepticism," Fall 1987, and "Wonder and Skepticism," January/February 1995.) Sagan's own contributions focused less on critiques of the media and more on creating news, skillfully using the media to inform and entertain about science. He preferred the positive approach, talking about what was correct rather than exposing errors in others.

Showman of Science

In the later 1970s, between the Viking mission to Mars and the anticipated Voyager encounters with Jupiter, Sagan decided to test the capacity of television to bring science to a mass audience. In partnership with engineer and entrepreneur Gentry Lee, a Viking colleague, he formed Carl Sagan Enterprises and began marketing a television series modeled on Jacob Bronowski's *Ascent of Man*. They developed a script, raised several million dollars in support, and hired Bronowski's director, Adrian Malone. At the same time Sagan fell rapturously in love with Ann Druyan, with whom he worked closely for the rest of his life. He and Annie moved to Los Angeles, and production at KCET Public Television started in 1977 on the 13-hour series called *Cosmos*.

His commitment to *Cosmos* finally eclipsed Sagan's academic roles. His classes were canceled, and several graduate students who had come to Cornell to work with him chose other advisors instead. Colleagues complained, and there was an effort to force his laboratory out of the Cornell Space Science Building. In Los Angeles, clashes of will between Sagan and Malone almost derailed the entire *Cosmos* effort. *Cosmos* aired in September 1980, accompanied by a promotional effort that exceeded anything seen before in public television. Most reviews were enthusiastic, and suddenly Sagan became a celebrity. The series won the Peabody Award, and eventually more than 400 million people saw *Cosmos* in dozens of countries around the world. The accompanying book, also called

Sagan with Ann Druyan in 1980 during the filming of *Cosmos*.

Cosmos, was on the *New York Times* best seller list for seventy weeks and made him wealthy as well as famous.

In October 1980, Sagan appeared on the cover of *Time*, shown wading in the "cosmic ocean." *Time* described him as the "Showman of Science" and the "prince of popularizers." They wrote: "Sagan sends out an exuberant message: science is not only vital for humanity's future well being, but it is rousing good fun as well. Watching with wonder—and no doubt a little envy—the whirling star named Sagan, some of his colleagues feel that he has stepped beyond the bounds of science. They complain that he is driven by ego. They also say that he tends to overstate his case, often fails to give proper credit to other scientists for their work, and blurs the line between fact and speculation. But they probably represent a minority view. Most scientists, increasingly sensitive to the need for public support and understanding of science, appreciate what Sagan has become: America's most effective salesman of science."

Sagan moved back to Cornell after *Cosmos*, but he could not return to the anonymity of the campus. People stopped him on the street and interrupted his meals in restaurants to tell him how much they liked *Cosmos* or to ask for his autograph. He mused to me at the time how strangers felt comfortable approaching him, since after all he had been in their living rooms (on TV). He also received crank calls and death threats, requiring police patrols of his home and prompting the university to remove his name from his office door and from the Space Science Building directory.

Fame also had its rewards. He bought a spectacular home modeled on an Egyptian temple, perched on the edge of one of Ithaca's wooded gorges, and hired a personal staff. He received an unprecedented advance from Simon & Shuster of $2 million for a science fiction novel to be called *Contact*, before he had written a word. *Contact* was published in 1985, and later made into a successful film starring Jodie Foster.

Sagan's popularity did me a service at about this time. Driving across West Texas, I was stopped for speeding. As the police officer started to write a ticket, he asked what I did for a living. When I mentioned that I had been Carl Sagan's student, he put away his citation book and launched into enthusiastic praise for Carl and, by implication, for his friends and students.

Sagan at Cornell in 1974 with three former students (L to R): David Morrison, Joseph Veverka, and James Pollack.

Journalist Joel Achenbach, in *Captured by Aliens* (1999), noted that once Sagan achieved superstardom with *Cosmos*, he became the public lightning rod for both the science and the pseudoscience of extraterrestrial life. As the "keeper of the gates" who effectively defined the border between science and pseudoscience, he was actively courted by many fringe figures who sought in his blessing a legitimization of their interests or beliefs. As an example, Achenbach reported this interview with Richard Hoagland, the popularizer of the "Face on Mars." Hoagland explained that in a public meeting in 1985, Sagan commented that those planning NASA missions to Mars should be open to discovering the unexpected. According to Hoagland, when Sagan made these remarks, he briefly made direct eye-contact with Hoagland, who was in the audience. In the weird world of pseudoscience, Sagan's innocent comment was interpreted as a coded message encouraging Hoagland to pursue his advocacy of an artificial origin for the Face—which he continues to this day, in spite of all the evidence to the contrary. (See some of Sagan's thoughts on the Hoagland/Mars Face matter in "Carl Sagan Takes Questions: More from his 'Wonder and Skepticism' CSICOP 1994 Keynote," SKEPTICAL INQUIRER, July/August 2005.)

Sagan's role is especially interesting because he himself was accused of straying beyond the limits of proper science in his pursuit of evidence for life on other planets and his defense of SETI. As Achenbach argues, it was precisely because of his apparent open-minded attitude toward fringe topics that many on the fringe became so bitter when Sagan turned against them.

Making a Better World

Sagan's rise to celebrity occurred simultaneously with Ronald Reagan's escalation of arms spending and cold war rhetoric. He told colleagues that he intended to return to the life of a professor, but he also felt he should use his new wealth and power to accomplish objectives of more global scope. As an early opponent of Reagan's Space Defense Initiative (SDI) or "Star Wars," he was able to rally vocal objections from the academic community that questioned both the technical basis for SDI and its potential destabilizing effect on the nuclear balance.

In 1982, an even more compelling opportunity presented itself, thanks to research involving two of his former students, Jim Pollack and Brian Toon (both at NASA Ames Research Center). With colleagues Rich Turco and Tom Ackerman, they were studying the influence of dust and atmospheric aerosols on global climate, working to understand the effects of martian dust storms and of the dust cloud that enveloped Earth following the asteroid impact that caused the extinction of the dinosaurs. In 1982, they had realized that smoke, especially from petrochemical fires, would have a much greater effect on global climate than naturally occurring dust. In fact, it appeared that the smoke from as few as 100 burning cities, when lofted into the stratosphere, could lead to severe global cooling (nuclear winter).

Turco and Toon flew to Ithaca in late 1982 to enlist Sagan's aid, for both the technical aspects of the research and as a means to overcome NASA objections based on the political implications of this work. This collaboration generated the TTAPS paper (named for the first initials of the authors, but with obvious symbolism) on nuclear winter published in *Science* in late 1983. The TTAPS authors concluded that even a less-than-full-scale nuclear exchange, especially if it were directed against cities, could cause global cooling and collapse of agriculture. The massive loss of life would hit victor, vanquished, or non-combatant nations alike.

Sagan used his prestige to argue that these new findings rendered nuclear war obsolete and undermined the concept of massive nuclear retaliation. The debate was international, including within the USSR, where it stimulated a rethinking of nuclear war-fighting strategies. But the pro-nuclear forces in the United States counterattacked vigorously, vilifying Sagan personally in the process. The *National Review* called nuclear winter "a fraud" and titled one cover story "Flat-Earth Sagan Falls off the End of the World."

Edward Teller, who at seventy-three was probably the second best known scientist in America, debated Sagan on nuclear winter before a special convocation of Congress. Sagan also led a delegation to meet with Pope John Paul II, who subsequently issued a papal statement against the build-up of nuclear arsenals. Many people credit this theory, and its advocacy by Sagan, as influential in the move toward nuclear disarmament and the end of the cold war.

Sagan oscillated between roles as scientist and political advocate. In this period, while attending a meeting of the imaging science team for the Galileo spacecraft, Sagan apologized to his teammates for his inability to commit more time to this mission, saying he was "putting most of my energy into saving the world from nuclear holocaust." Most team members agreed that this effort should indeed have a higher priority for Sagan than planning imaging sequences for the moons of Jupiter.

In parallel with its escalation of the arms race, the Reagan administration cut back drastically on NASA's program of planetary exploration. In 1981 they threatened to close down the highly successful Voyager 2 spacecraft before its Uranus and Neptune encounters and to turn the Jet Propulsion Laboratory

into a defense contractor lab. After the space shuttle *Challenger* accident in 1986, the momentum seemed to have left NASA, just when Sagan was advocating an accelerated exploration program in his books and lectures. At the same time the USSR, under the influence of Mikhail Gorbachev's reforms, seemed more open to international collaboration.

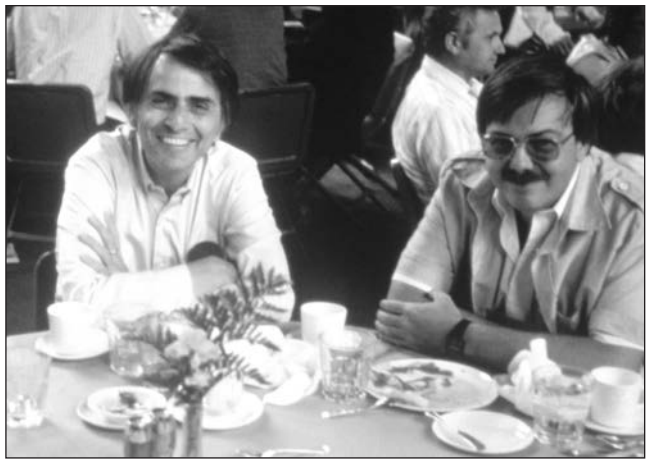
Sagan saw an opportunity to achieve two goals of noble dimension. By working together on missions to Mars, the US and the USSR could build confidence and gain experience that would ultimately defuse the cold war and permit cooperation in other areas. By pooling their resources, these two space-faring nations could accomplish together what neither could afford alone—extending human presence into the solar system—and simultaneously ensure peace on Earth.

Sagan formed a close working relationship with Roald Sagdeev, the director of the Space Research Institute in Moscow, and together they opened up the Soviet planetary exploration program, with unprecedented live reporting of the Soviet flybys of Comet Halley in 1986. In Russia, he associated with Soviet cosmonauts and government officials as well as scientists. For a few years, under his leadership, anything seemed possible. Then the USSR disintegrated, and many of its space scientists found themselves unemployed. With the failure of Russia's last three planetary missions (all destined for Mars), both the motivation and the capability of Russia to partner in exploration of the solar system evaporated.

Disappointments

By the time of the final Voyager encounter with Neptune in 1989, it was apparent that Sagan's campaign to promote human expansion to Mars was doomed. His Russian friend Sagdeev was emigrating to the United States and marrying (of all people) Dwight Eisenhower's granddaughter. And after a decade of budget cuts, NASA seemed unable to summon the resources even to maintain a modest program of robotic space exploration. The high hopes of the Viking and Voyager era were gone. In a 1989 lecture at JPL, Sagan could not conceal his frustration and disappointment—the first time I had seen him unable to summon an optimistic perspective. However, worse personal blows were about to fall.

In the autumn of 1990, Sagan made his most serious scientific blunder. Threatened with military opposition to its invasion of Kuwait, Iraq threatened to set fire to the nation's oil wells. Sagan became concerned that the quantity of petrochemical smoke generated by these oil-field fires could generate a small-scale nuclear winter, endangering crops across Asia and threatening world food production. Of his four TTAPS co-authors, only Turco supported this hypothesis; Pollack, Toon, and Ackerman could not see how sufficient smoke could get into the stratosphere. However, Sagan went public with dire predictions. While he kept his predictions conditional, saying only that we could *not* show that massive oil-field fires *would not* have major climatological consequences (a "double negative" logic that he used frequently), his doomsday warning was widely reported. The oil fields were torched in January 1991, blackening the sky over most of Kuwait and



Sagan with the author at a planetary science meeting in 1983.

disrupting the coastal ecosystem, but there were no climatic effects, even on a local scale. Sagan was widely criticized, and the episode had the further effect of undermining the credibility of the entire nuclear winter scenario.

The next year Sagan was nominated for membership in the National Academy of Sciences. Academy membership requires distinguished research scholarship, but that is rarely sufficient to ensure membership. Considerable weight is also given to public service, as well as more political factors such as where a nominee works and whom he or she knows. Most colleagues agreed that Sagan's research record was more than adequate (Shermer 1999), and that his additional journal editorship, government service, and contributions to public understanding of science should have ensured his election. But Sagan was blackballed in the first voting round, requiring a full debate and vote by the Academy membership. In the final vote he barely received 50 percent yes votes, far short of the two-thirds majority required for election to membership.

Two years later, the National Academy awarded Sagan its prestigious Public Welfare Medal, perhaps in partial compensation for his earlier rejection. The damage was done, however: not only a stinging personal blow, but also an attack on his credibility as a spokesperson for science. For all his accomplishments—or perhaps because of some of them—influential members of the academic "old boys" network never accepted him.

Other problems multiplied. In 1993 the NASA SETI program, which he had defended on critical occasions in the past, was abruptly terminated by Congress. His book on nuclear winter, written with Turco, sold only a few thousand copies; no one cared much any more about issues of nuclear war. Perhaps worst of all, a book that he and Annie put a great deal of themselves into, *Shadows of Forgotten Ancestors*, did not receive the enthusiastic welcome they expected. Although some reviewers consider it one of Sagan's best works, it was not a best seller. No longer a media star, Sagan was slipping from public consciousness.

A Candle in the Dark

Sagan's most important contributions in his final years were in the struggle against pseudoscience. Throughout the last decade

of the millennium, this scourge of public irrationality grew, as astrology, alien abductions, alternative medicine, and any number of other New Age and "millennial" fads and cults gained in popularity. Sagan fought back, and after the death of his friend Isaac Asimov, his was the voice most often heard in defense of scientific reason in the United States.

His most influential platform was provided by the weekly newspaper-supplement magazine *Parade*, one of the two most widely read publications in America. His column appeared there regularly for more than a decade, providing a unique opportunity for outreach and education. He discussed the latest discoveries in science, debunked the purveyors of flimflam, and also delved into sensitive topics of public concern such as abortion and animal rights. His articles in *Parade* provided the basis for many chapters in his final three books, *Pale Blue Dot*, *The Demon-Haunted World*, and *Billions and Billions*.

The Demon-Haunted World, subtitled *Science as a Candle in the Dark*, was a passionate defense of science against pseudoscience and irrationality, as illustrated in the following quotes. "It is far better to grasp the Universe as it really is than to persist in delusion, however satisfying and reassuring [that may be]. . . . Superstition and pseudoscience keep getting in the way [of understanding nature], providing easy answers, dodging skeptical scrutiny, casually pressing our awe buttons and cheapening the experience, making us routine and comfortable practitioners as well as victims of credulity. . . . [Pseudoscience] ripples with gullibility. . . . The tenants of skepticism do not require an advanced degree to master, as most successful used car buyers demonstrate. The whole idea of democratic application of skepticism is that everyone should have the essential tools to effectively and constructively evaluate claims to knowledge. . . . But the tools of skepticism are generally unavailable to the citizens of our society. . . .Those who have something to sell, those who wish to influence public opinion, those in power, a skeptic might suggest, have a vested interest in discouraging skepticism" (Sagan 1995).

While vigorously advocating the concepts of scientific skepticism, Sagan also raised questions about strategy. He wrote that "The chief difficulty I see in the skeptical movement is in its polarization: Us vs. Them—the sense that we [skeptics] have a monopoly on the truth; that those other people who believe all these stupid doctrines are morons." He was especially troubled by anti-religious attitudes. While not a believer himself, Sagan had constructive interactions with religious leaders, including the Pope and the Dalai Lama. He wrote "There is no necessary conflict between science and religion. On one level, they share similar and consonant goals, and each needs the other."

Although more demanding and hence less popular than his books about astronomy and planetary exploration, *The Demon-Haunted World* is arguably his most mature and valuable publication. Expressing his concerns about the irrationalism that pervades modern society, he wrote: "I know that the consequences of scientific illiteracy are far more dangerous in our time than in any time that has come before. It's perilous and foolhardy for the average citizen to remain ignorant about global warming, say, or ozone depletion, air pollution, toxic and radioactive wastes, topsoil erosion, tropical deforestation, exponential population growth. . . . How can we affect national policy—or even make intelligent decisions in our own lives—if we don't grasp the underlying issues? . . . Plainly there is no way back. Like it or not, we are stuck with science. We had better make the best of it. When we finally come to terms with it and fully recognize its beauty and power, we will find, in spiritual as well as in practical matters, that we have made a bargain strongly in our favor."

Sagan's example has contributed to increasing efforts by scientists to reach out to the press and the public. For the first time in the 1980s, such professional organizations as the American Astronomical Society and the American Geophysical Union appointed full-time press officers and began sponsoring press conferences at their annual meetings. NASA missions also undertook to identify and encourage project scientists to speak with the press, both informally and as official NASA spokespersons. In the late 1990s this extended to welcoming commercial HDTV crews into high-level NASA meetings and spacecraft encounters. Breaking with tradition, the space agency was now anxious to show the human side of scientific exploration. In the 1960s, Sagan was almost alone in his work with the press, but such activity had become relatively common among space scientists two decades later. None, however, has approached Sagan's level of charisma or public name recognition.

Cornell's President Frank Rhodes, speaking at Sagan's sixtieth birthday celebration, summarized his impact: "I want to salute Carl Sagan . . . as the embodiment of everything that is best in academic life . . . in scholarship, teaching, and service. . . . Carl is an inspiring example of the engaged, global citizen . . . . [He is] a master of synthesis, and he has used that skill to engage us as a society in some of the biggest issues of our time. . . . With the conscience of a humanist and the consummate skill of the scientist, he addresses the needs of the society in which we live, and we are the richer for it" (Terzian and Bilson 1997).

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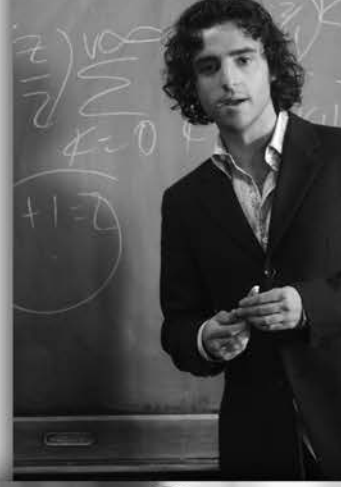
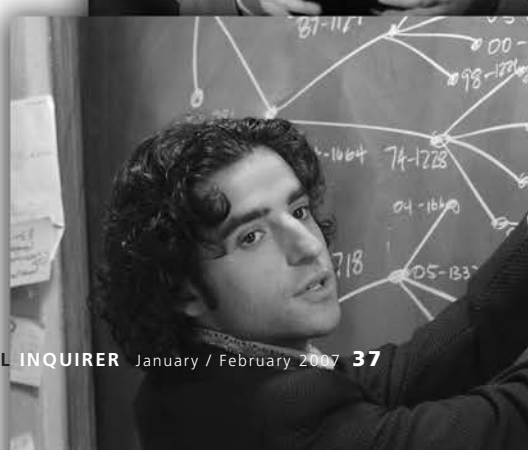
Do They Have Your Numb3r?

CBS's popular Friday night drama uses—surprise!—mathematics, reason, and rationality to help the FBI solve major crime mysteries. This is network television?

KENDRICK FRAZIER





Direct Network Flow Problem.
Probabilistic Graph Theory.
Soap Bubble Theory.
Isospectral Geometry.
Social Network Analysis.
Gaussian Plume Dispersion Model.
Linear Discriminant Analysis.

What television series would you guess discussed and demonstrated these mathematical concepts this past year? *Nova? Scientific American Frontiers?* A documentary on the Discovery Channel?

No, these mathematical techniques were integral to the prime-time dramatic television series *Numb3rs*, which began its third season September 22 on CBS.

Just as the trio of *CSI* dramatic programs has brought the importance of forensic science to the masses in the U.S. and abroad (SI May/June 2005; CBS says *CSI: Miami* is now the most watched television show in the world), *Numb3rs* is now demonstrating to millions of viewers each Friday night that mathematics can also have surprising relevance to everyday problems. And all the while providing quality entertainment.

Mathematics is not just a sideshow in the popular television mystery series, which stars David Krumholtz as brilliant young mathematician Charlie Epps, who helps his FBI agent brother Don (Rob Morrow) tackle particularly puzzling cases. More often than not, it is Charlie, seeking mathematical patterns and applying novel mathematical concepts, who plays a central role solving the cases. Judd Hirsch plays Charlie's and Don's widowed father, a semi-retired city planner. The quirky Peter MacNicol also stars as Dr. Larry Fleinhardt, Charlie's physicist mentor and sounding board for new ideas and broader scientific thinking. Navi Rawat plays a former graduate student of Charlie's from CalSci (a close stand-in for Caltech) and as a bright and attractive woman provides some continuing love interest.

Science, reason, and rational thinking play such a prominent role in the stories that the American Association for the Advancement of Science hosted an entire afternoon symposium at its 2006 annual meeting on the program's role in changing the public's perception of mathematics. Nobel laureate David Baltimore, the president of CalTech, took part, and I counted two other Nobel laureates in the audience.

And this past spring, *Numb3r*s co-creators and executive producers, Cheryl Heuton and Nicolas Falacci, a husband-and-wife team, were honored with the Carl Sagan Award for the Public Understanding of Science. The award was presented by the Council of Scientific Society Presidents, honoring those who have become concurrently accomplished as researchers, educators, and magnifiers of the public's understanding of science.

"What I especially appreciate about *Numb3rs*," CSICOP Fellow and Temple University math professor John Allen Paulos told the SKEPTICAL INQUIRER, "is that more often than not the math is somewhat integral to the show, and isn't just decorative. Also there's little irrelevant and intimidating dialogue like, 'Ah yes, that's a locally compact Hausdorf space we have here.'" Paulos is author of *Innumeracy* and other books championing better understanding of mathematics and a recipient of the 2003 AAAS Award for Public Understanding of Science and Technology.

How did a show incorporating mathematics as a key component ever get sold to hard-nosed, cynical Hollywood producers?

First of all, points out Heuton, "CBS is not in the business of teaching math. CBS is in the business of reaching viewers." She acknowledges that the wild success of the three *CSI* (crime scene investigations) series produced for CBS by Jerry Bruckheimer helped pave the way for the idea. "We were interested in a show featuring mathematics," she says, "and we knew we would have to put it into a format that would appeal to the execs—a crime show."

"We were sure it was going to be a very hard sell," she says. A twenty-minute "pitch" meeting was set up. Five minutes into the pitch the answer came: "Let's go ahead" (with a pilot). "That each step went so well remains to Nick and me completely shocking," she says.

From the beginning, mathematics was to be featured, not downplayed. Episodes begin with a spoken tribute about the importance of mathematics: "We all use math everywhere. To tell time, to predict the weather, to handle money. . . . Math is more than formulas and equations. Math is more than numbers. It is logic. It is rationality. It is using your mind to solve the biggest mysteries we know."

When was the last time you heard characters in a prime-time television series tout mathematics and rationality? Let alone really using the mind?

Heuton says in an early test, twelve women who watched the show were asked why. "They said, 'We love the math.' The head of Paramount TV turned to me and said, 'I'm flabbergasted.'"

Some previous movies and shows have included mathematics, notes Tony F. Chan, as of October 1 the assistant director for mathematics and physical sciences at the National Science Foundation. (At the time of the AAAS symposium, which he moderated, Chan was dean of the Division of Physical Sciences and former chairman of the Mathematics Department at the University of California at Los Angeles.) He mentions *Beautiful Mind, Good Will Hunting,* and *Straw Dogs*. But, he says, "*Numb3rs is* mathematics."

When *Numb3rs* premiered January 25, 2005, it had 25,000,000 viewers. It is still one of the two most watched shows on Friday nights. Although it had somewhat higher ratings earlier, its 2006–2007 season opener drew 11,400,000 viewers, good enough for a ranking of 32nd among all shows on television.

Gary Lorden, chairman of the department of mathematics at Caltech, serves as the program's math consultant. The show recruited him in 2004. "I come up with math ideas, techniques," he says. He produces pages of papers. The equations that fill the blackboard (or, more often, transparent plastic for more dramatic display) when Charlie extemporizes are real. "All that stuff on the blackboard is real mathematics," he says.

Lorden says Charlie's character is loosely based on Richard Feynman. "He's really smart, creative. Give him a problem and let him go." And he notes, sometimes Charlie's wrong. "Just as in math."

David Krumholtz, the actor who plays Charlie, is certainly one of the key reasons for the show's appeal. With long hair, dark, expressive eyes, and an ability to convey simultaneously an intense passion for mathematics and a kind of endearing vulnerability, he's an attractive character. He is self-deprecating about his character's combination of awkward intelligence and good looks. "Charlie's a 'geek/sheik, a smart/throb,'" he laughs. And although he is definitely not a mathematician ("I flunked

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algebra I twice"), Krumholtz says he has quickly become a fan not only of the value of math "but of reason and rationality."

"Once you understand the Fibonacci sequence," which played a central role in one episode, "you can't get past that without becoming a different person," he says. "I've become a deductive reasoner. I try to embody the character as best I can. I spend a lot of time at Caltech, wandering around, going into some of the classes. I listened to some [recordings of] Feynman lectures."

He says he passionately believes in the message Charlie speaks in one episode: "Math *is* the real world. It's everywhere. Math is nature's language. It is nature's way of communicating with us. . . . Applying this stuff to real-life applications is very powerful."

Numb3rs co-creator Nick Falacci, NSF/UCLA mathematician Tony Chan, *Numb3rs* star David Krumholtz, co-creator Cheryl Heuton, Caltech math chairman Gary Lorden, and Bill Nye ("The Science Guy") at AAAS session devoted to *Numb3rs*' contribution to improving the public's perception of mathematics. Photo by Kendrick Frazier

Every show features a turning point where Charlie explains a mathematical idea, and here the show's visual effects department stepped up from the beginning. The graphics are visually stunning, and often very creative in simply explaining a difficult concept.

"We visualize the math," Krumholtz says. "When we cut away to these visuals, it's not vacuum. I do it in real time. It gives it spontaneity."

"The visuals are indeed key," says co-creator Nick Falacci. "First the episodes have to be written. Then we look for visual metaphors. Then we have a team of special effects people try to make it as simple and direct as possible. I knew that people wouldn't try to solve the equations, but I knew that if people could understand the basic concepts behind the math, it really could be very exciting."

CBS was pleased with the first visual sequence but suggested it could be recycled for each episode. Says Falacci: "We had to tell CBS, just as every math concept is different, so every metaphor is different."

Even though the show is a drama, Caltech's Lorden says he thinks it serves as a model for how "educational TV" could have been, or perhaps still might be.

Heuton, a television pro and a realist, cautions, however: "*Numb3rs* was designed to be a prime-time network show. *Numb3rs* was not designed to be an educational show." And she's right. It is, it should be remembered, a crime drama. As such it has numerous side plots involving human interactions of its many characters (I especially like the family interactions among Charlie, Don, and their father) and its fair share of intense moments, chases, violence, shootings, explosions, and other expected fare of the genre. Nevertheless, the repeated emphasis and use of mathematical thinking as a core plot element is, well, unique.

Is the university in *Numb3rs* really Caltech? Very close. "I was a supporter of its being Caltech, not CalSci," says Caltech president David Baltimore, a Nobel laureate in medicine. But Caltech's lawyers felt otherwise. "We [Caltech] are very strong supporters of this show. We are proud of Gary's involvement, and we have opened the campus to the show. Anything that says math and science is important is worth supporting."

Television science popularizer and CSI Fellow Bill Nye ("Bill Nye the Science Guy") is also a supporter. He even appeared in one episode last season, as a combustion researcher. "What's impressive to me," he said at the AAAS session, "is how passionate these people are. It's been fun to hang around with these guys."

Krumholtz says he feels fortunate to be involved in *Numb3rs*. "I am the major receptacle of gratitude for the show because I'm its public face," he says. "It is really inspiring to be the beacon for that. I'm glad that they have allowed me to do this show. I want him [Charlie] to be as believable as possible."

The show has changed him, he says. "In general I am a more logical thinker. My friends hate this. . . . I love it. I used to hate math. I felt stupid, inept. Now I feel I'm more whole. If there's one kid out there that *Numb3rs* helps to feel not stupid, inept, then that's a wonderful thing to do. My dream is that thirty to forty years down the line I might meet someone who says, 'I won the Nobel Prize because I watched you in *Numb3rs*.'" □

Numb3rs Math Education Program on Web

Numb3rs also hosts a Web-based educational outreach program for teachers and students, providing activities relating to each episode's mathematics. Texas Instruments sponsors this "We All Use Math Every Day" Web site (www.cbs.com/prime-time/numb3rs/ti/) in partnership with CBS and in association with the National Council of Teachers of Mathematics. Each activity has been derived from the math used in the TV show and created by practicing classroom teachers and mathematicians especially for grades 7–12.

Numb3rs stars David Krumholtz and Navi Rawat have helped promote the education initiative at annual meetings of NCTM and other professional organizations.

The 'Vise Strategy' Undone

Kitzmiller et al. v. Dover Area School District

Here's an inside look at the first legal case testing intelligent design, Kitzmiller et al. v. Dover Area School District, *by one of the expert witnesses for the pro-evolution side. The "Darwinists" won the landmark case, establishing the first legal precedent restricting the teaching of intelligent design in public-school science classes.*

BARBARA FORREST

In a post on his Uncommon Descent (UD) blog on May 6, 2005, intelligent-design (ID) creationist William Dembski was talking tough. He offered a lesson for "Darwinists" drawn from the then-ongoing hearings held before the Kansas Board of Education on May 5–7 to discuss the Kansas science standards. The creationist-dominated board had hoped that pro-evolution scientists and ID creationists would debate revisions proposed by the creationist minority on the board's Science Curriculum Writing Committee. These revisions included redefining science to allow the supernatural as a scientific explanation. Refusing to lend legitimacy to this "Kansas kangaroo court," scientists boycotted the hearings. The only pro-evolution participant,

Dover Area High School

representing pro-science groups, was attorney Pedro Irigonegaray, who cross-examined many of the twenty-three creationists who were brought in at taxpayer expense to testify. These twenty-three are supporters of Dembski and his associates, who have promoted ID for a decade from the Center for Science and Culture (CSC), the creationist arm of the Discovery Institute (DI), a conservative Seattle think tank.

Grousing that "only the evolution critics are being interrogated," Dembski was "waiting for the day when the hearings are not voluntary but involve subpoenas in which evolutionists are deposed at length." When "that happy day" comes, Dembski predicted, the Darwinists "won't come off looking well." On May 11, Dembski portrayed "evolutionists" as too chicken to participate: ". . . evolutionists escaped critical scrutiny by not having to undergo cross-examination . . . by boycotting the hearings." He proposed a "vise strategy" for "interrogating the Darwinists to, as it were, squeeze the truth out of them," childishly illustrated with a photograph of a Darwin doll with its head compressed in a bench vise. On May 16, he outlined his strategy: "interrogating Darwinists" about "five terms: science, nature, creation, design, and evolution." Under subpoena, they would be compelled to answer, hence the "vise" metaphor.

Dembski already knew that such a day of legal reckoning was approaching. Exactly one month later, on June 6, he sat across from me when I was deposed as an expert witness for the plaintiffs in the first ID legal case, *Kitzmiller et al. v. Dover Area School District*. He attended my deposition as the adviser to the lead defense attorney, Richard Thompson of the Thomas More Law Center, and was scheduled to be deposed himself on June 13 as a defense witness. Besides being on opposite sides, there was another big difference between us: I showed up for my deposition. Dembski "escaped critical scrutiny by not having to undergo cross-examination" when he withdrew from the case on June 10.

Not only did I show up for my deposition, but I also testified at the trial despite being delayed by Hurricanes Katrina and Rita. Moreover, I had the distinction of being the only witness whom the defense tried to exclude from the case. When they failed, the Discovery Institute tried to discredit me with ridicule.

A Brief History of the Kitzmiller Case

In October 2004, the Dover [Pennsylvania] Area School District Board of Directors decided that "Students will be made aware of gaps/problems in Darwin's theory and of other theories of evolution including, but not limited to, intelligent design." In November, they announced that Dover High School's ninth-grade biology teachers would read a statement informing students that "Darwin's Theory . . . is not a fact" and that "intelligent design is an explanation of the origin of life that differs from Darwin's view." The statement referred students to the creationist textbook, *Of Pandas and People*, to learn "what intelligent design actually involves." On December 14, eleven parents filed suit in the Middle District of Pennsylvania, represented by attorneys from the ACLU, Americans United for Separation of Church and State, and Pepper Hamilton, a Philadelphia law firm. The Thomas More Law Center (TMLC), a Michigan Religious Right legal organization, repre-

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sented the board. United States District Judge John E. Jones III was assigned to hear the case.

Dover's problems actually started in 2002. Bertha Spahr, chair of Dover High School's science department, began to encounter animosity from Dover residents toward the teaching of evolution. In January 2002, board member Alan Bonsell began pressing for the teaching of creationism. In August, a mural depicting human evolution, painted by a 1998 graduating senior and donated to the science department, disappeared from a science classroom. The four-by-sixteen-foot painting had been propped on a chalkboard tray because custodians refused to mount it on the wall. Spahr learned that the building and grounds supervisor had ordered it burned. In June 2004, board member William Buckingham, Bonsell's co-instigator of the ID policy, told Spahr that he "gleefully watched it burn" because he disliked its portrayal of evolution. He also blocked purchase of a new science textbook that included evolution, forcing teachers to accept *Pandas* as a reference book in exchange for new textbooks. In January 2005, science teachers refused to read the ID statement; administrators read it themselves. The situation worsened. When the next school year began in September 2005, the board's policy and ID itself were on trial in Harrisburg, Pennsylvania.

Barbara Forrest

Trouble behind the Scenes

Besides myself, the other expert witnesses for the plaintiffs were scientists Kevin Padian and Kenneth Miller, theologian John Haught, science-education expert Brian Alters, and philosopher of science Robert Pennock. Our combined work addressed all relevant aspects of ID creationism. The National Center for Science Education (NCSE) staff were consultants for the plaintiffs' team. Everyone on the plaintiffs' team, including the attorneys, served *pro bono*. (None of the defense's expert witnesses participated *pro bono*. All listed their fees—typically $100 per hour, but $200 per hour in Dembski's case—in their expert witness reports.) Our pretrial preparations went smoothly, but things weren't going as well for the defense.

Dembski's CSC associates, Stephen C. Meyer, John Angus Campbell, Scott Minnich, and Michael Behe, were also to be witnesses for the defense, along with ID supporters Warren Nord, Steve William Fuller, and Dick M. Carpenter II. When TMLC rejected Meyer, Dembski, and Campbell's demand for legal representation independent of TMLC, the three withdrew from the case by refusing to continue without their own attorneys.[1] In the case of Campbell, Pepper Hamilton attorney Thomas Schmidt had flown to Memphis with a legal assistant and had hired a court reporter to take Campbell's long-scheduled deposition. Everything was proceeding on schedule until only minutes before the deposition was to begin, when defense attorney Patrick Gillen announced that TMLC would "no longer retain" Campbell as a witness because Campbell had "retained counsel through Discovery Institute" and had "discussed matters [with DI] to which I am not privy." Gillen learned of "these developments" only the night before. Behe and Minnich, already deposed, remained as witnesses along with Nord, Fuller, and Carpenter.

Why would three of the most important ID experts withdraw? They had already submitted expert-witness reports and scheduled depositions. Moreover, DI had hoped for years to precipitate a test case and had even prepared legal arguments. The problem, however, was that DI did not want *this* case, because the Dover board, urged on by TMLC, had explicitly crafted its policy to promote "intelligent design." Having come to view that term as a legal liability after encountering opposition in Ohio, Kansas, and elsewhere, DI tried unsuccessfully to persuade the board to either restate the ID policy in sanitized language or withdraw it. (DI now strategically sanitizes its terminology, using euphemisms and code words in appeals for the teaching of ID.) They were scared to death of a case they had not initiated and could not control.

The exodus of Dembski, Meyer, and Campbell is explained by their fear of cross-examination. The public shredding that Irigonegaray had given ID creationists in Kansas one month earlier was still fresh. As Pat Hayes stated it in a report on his blog, dated May 9: "The knockout punch came when . . . Pedro Irigonegaray compelled the intelligent design witnesses to confess, during a series of withering cross-examinations, that they hadn't bothered to read the science standards draft . . . before coming to Kansas at taxpayer expense." Moreover, Dembski, Meyer, and Campbell knew what the plaintiffs' expert witnesses would say in court, because they had our reports. DI must have known that our case would be devastating to the defense—and thus to ID—if it was argued before a judge who respected the truth and the Constitution.

My Role in the Kitzmiller Trial

I was called as a witness because of my coauthorship, with Paul R. Gross, of *Creationism's Trojan Horse: The Wedge of Intelligent Design* (Oxford University Press, 2004) and other publications about ID. In our book, we analyze a document titled "The Wedge Strategy," CSC's tactical plan, showing how CSC

creationists are executing every phase except producing scientific data to support ID. We show that ID is creationism, thus a religious belief, using the best evidence available: the words of ID leaders such as Phillip E. Johnson, William Dembski, and their ID colleagues. We also show ID's continuity with earlier creationism. My job was to present this evidence to the judge.

It probably wasn't difficult for DI and TMLC to figure out that, armed with my work and that of the other witnesses for the plaintiffs, halfway decent attorneys would make legal mincemeat of them. And the plaintiffs' attorneys were more than decent—they were superb. Pepper Hamilton's Eric Rothschild, one of the lead attorneys, prepared me well.[2] Dembski had seen a preview of my testimony at my deposition. DI also knew I was inspecting documents related to *Of Pandas and People* that our attorneys had subpoenaed from the Foundation for Thought and Ethics (FTE), which holds the *Pandas* copyright. Consequently, although DI and TMLC were squabbling behind the scenes, they shared a common goal: to either forestall or discredit my testimony.

On September 6, 2005, the defense filed a motion requesting my exclusion from the case. DI and TMLC had apparently overcome their differences long enough to collaborate on the accompanying brief, because it contained clear evidence of DI's input. Although I was not called as a scientific expert, the defense argued that I should be excluded because I had no scientific expertise and because I am, in their words, "little more than a conspiracy theorist and a web-surfing, 'cyber-stalker' of the Discovery Institute . . . and its supporters and allies." Five years earlier, Dembski had accused two of his critics, Wesley Elsberry and Richard Wein, of being "Internet stalkers who seem to monitor my every move." DI had responded to *Creationism's Trojan Horse* by labeling me as a conspiracy theorist.[3] Judge Jones denied the motion on September 22.

Scheduled to testify the following week but delayed by Hurricane Rita, I used the extra time to prepare for my testimony and to stay current on ID activities by visiting DI's Web site. On September 29, I noticed that DI had posted a transcript of an interview I had done—except that I hadn't done it. The transcript was fake. Apparently meant (though not marked) as a parody, the organization whose self-described goal is "to support high quality scholarship . . . relevant to the question of evidence for intelligent design in nature" ridiculed me by, among other things, having fictitious radio host "Marvin Waldburger" refer to me as "Dr. Barking Forrest Ph.D." If DI thought this would unsettle me, they were ignoring the fact that I had just been through two killer hurricanes. I could only shake my head at their doing something so jaw-droppingly stupid. If they were hoping Judge Jones would see and be influenced by this silliness, it was just another sign of the disrespect for his intelligence and integrity that began before the trial and continues today (more on this shortly).

On the Witness Stand

When I was sworn in on October 5, the defense spent the entire morning presenting arguments as to why I should not be qualified as an expert witness. Judge Jones again denied the motion, meaning that he—and the whole world—would hear what both DI and TMLC had hoped they could bar from the record: the truth about ID.

I had two tasks: to demonstrate to Judge Jones (1) that ID is creationism, thus a religious belief, and (2) that *Of Pandas and People* is a creationist textbook. As part of the evidence for my first task, I included the words of two leading ID proponents, Phillip E. Johnson and William Dembski. Under direct examination by Eric Rothschild, I related Johnson's definition of ID as "theistic realism" or "mere creation," by which he means that "we affirm that God is objectively real as Creator, and that the reality of God is tangibly recorded in evidence accessible to science, particularly in biology." To that, I added Dembski's definition: "Intelligent design is just the Logos theology of John's Gospel restated in the idiom of information theory." If the judge had heard nothing except these two quotes, he would have had all the evidence he needed that ID's own leaders regard it as not only creationism but also as a *sectarian Christian* belief. But I had much more, such as CSC fellow Mark Hartwig's 1995 *Moody Magazine* article, in which he referred to a 1992 ID conference at Southern Methodist University as a meeting of "creationists and evolutionists," calling Dembski and Stephen Meyer "evangelical scholars." During those early years, when they needed money and supporters, ID proponents openly advertised both their religiosity and their creationism.

However, none of the evidence for ID's religious, creationist identity was more important than "The Wedge Strategy," probably written in 1996, when the CSC was established, but revised in 1998. Known informally as the "Wedge Document," it was leaked from a Seattle office and posted on the Internet in early 1999. DI did not acknowledge ownership of it until 2002, after I independently authenticated it and wrote about it in 2001. The technical team hired by Pepper Hamilton to create computer "demonstratives" projected the Wedge Document onto a screen in court, and I walked Judge Jones through it, explaining the most important parts. My first slide made its significance clear: ". . . could I have the first slide, please? This is the first page of the Wedge Strategy, and this is the opening paragraph of it. Quote, 'The proposition that human beings are created in the image of God is one of the bedrock principles on which western civilization was built.' This . . . states very well the foundational belief behind the intelligent design movement and the reason that they have rejected the theory of evolution." As I continued, the judge heard the strategy's explicitly Christian goals: "Design theory promises to reverse the stifling dominance of the materialistic worldview and to replace it with a science consonant with Christian and theistic convictions." The folks at DI probably never imagined that an "obscure philosopher in Louisiana," as they once called me, would be using their strategy document in a trial—or that it would be so effective in their legal undoing. (Though actually, they probably did suspect its legal significance, which explains their taking three years to acknowledge it.)

To counter the defense's predictable denials that ID is creationism, I also explained, using an account by ID proponent and CSC fellow Paul Nelson, how Phillip Johnson had master-

minded creationism's transformation into "intelligent design" after the United States Supreme Court outlawed creationism in public schools in its 1987 *Edwards v. Aguillard* ruling. According to Nelson, creationists believed that *Edwards* meant the death of the "two-model approach to origins," in which creationists recognize only two alternatives, either evolution or creation, hoping to win by default after undermining evolution. But Nelson explained that "a revolution from an unexpected quarter . . . was about to occur." The revolutionary was Johnson, who decided that, for creationism to survive *Edwards*, creationists had to redefine science: "Definitions of science, [Johnson] argued, could be contrived to exclude any conclusion we dislike or to include any we favor." Not only was Johnson's deliberate but nominal transformation of creationism into ID important for demonstrating ID's true identity, but it also provided important support for my testimony about *Pandas*: to survive after *Edwards*, *Pandas* would require a similar transformation. (When the book was first published in 1989, Johnson was already allied with chemist Charles Thaxton, author of the creationist book *The Mystery of Life's Origin* and "academic editor" of *Pandas*.) The subpoenaed FTE documents, which contained several earlier *Pandas* drafts, revealed that precisely such a transformation had been effected.

A *Pandas* coauthor, CSC fellow Dean H. Kenyon, had been a creationist witness in the *Edwards* case and had submitted a sworn affidavit testifying that "creation-science is as scientific as evolution." I discovered a letter Kenyon wrote to FTE president Jon Buell, showing that he was working on the 1986 draft of *Pandas*, then called *Biology and Creation*, while also assisting in the *Edwards* case! All pre-*Edwards* drafts of *Pandas* (there were at least five) were written using creationist terminology. The earliest drafts had overtly creationist titles. In 1987, the title was changed to *Of Pandas and People*, and there were two drafts in that year. One was written in creationist language; in the other, creationist terminology had been replaced by "intelligent design" and other design-related terms, suggesting that the *Edwards* decision prompted this change. The clincher was a new footnote in the latter draft explicitly referencing *Edwards*, indicating that this draft was produced *after* the June 19, 1987, decision in an effort to evade the ruling. I also found a letter from Buell to a prospective publisher in which Buell made profit projections for *Pandas* contingent upon the Court's decision: "The enclosed projection showing revenues of over 6.5 million in five years are based upon modest expectations for the market, provided the U.S. Supreme Court does not uphold the Louisiana Balanced Treatment Act. If by chance it should uphold it, then you can throw out these projections. The nationwide market would be explosive."

These excerpts reflect the general content of the evidence I produced during my day and a half of testimony. When Richard Thompson cross-examined me, he did what we anticipated: avoiding the substance of my testimony and my published work, he attacked my credibility. He apparently hoped the judge would consider my association with civil-liberties and humanist organizations unsavory enough to discredit me, asking questions such as, "When did you become a card-carrying member of the ACLU?"

The Defense

The combined testimony of the plaintiffs' expert witnesses presented a formidable obstacle for the defense—as did the testimony of defense witnesses themselves. Nord and Carpenter were withdrawn without testifying, leaving only Behe, Fuller, and Minnich.[4] Behe and TMLC attorney Robert Muise escorted the judge through a long explanation of irreducible complexity using Behe's stock example, the bacterial flagellum. During Rothschild's cross-examination, however, Behe admitted that under his own definition of a scientific theory (which he has conveniently loosened in order to classify ID as science), astrology also qualifies. Most unhelpfully, Fuller had affirmed in his deposition—under oath—that ID is creationism. Presented by ACLU attorney Vic Walczak with the relevant statements, he had no choice but to admit this:

> Walczak: "And then your answer beginning on Line 24, 'It [ID] is a kind of creationism, it is a kind of creationism.' I didn't read the same passage twice. It's actually twice on there. Did I read that accurately?"
>
> Fuller: "Well, it looks like that is what the sentences say."

Fuller also described his role in the trial as that of an advocate for "disadvantaged theories" needing an "affirmative action strategy." By the time Minnich, the last witness, was asked to offer still more testimony about bacterial flagella, he understood fully the position in which he found himself: "I kind of feel like Zsa Zsa's fifth husband, you know? . . . I know what to do but I just can't make it exciting. I'll try."

The Verdict on ID

On December 20, 2005, Judge Jones delivered a powerful opinion—a marvel of clarity and forthrightness—giving no quarter to either the school board or ID. He was not fooled by ID proponents' denials that they are creationists: "ID cannot uncouple itself from its creationist, and thus religious, antecedents." He was especially displeased that board members Buckingham and Bonsell had lied under oath during their depositions: ". . . the inescapable truth is that both Bonsell and Buckingham lied at their January 3, 2005 depositions about their knowledge of the source of the donation for *Pandas*. . . . This mendacity was a clear and deliberate attempt to hide the source of the donations . . . to further ensure that Dover students received a creationist alternative to Darwin's theory of evolution." Presented with the truth about the board's policy and the ID creationism it promoted, Jones ruled accordingly: "A declaratory judgment is hereby issued in favor of Plaintiffs . . . such that Defendants' ID Policy violates the Establishment Clause of the First Amendment of the Constitution of the United States and . . . the Constitution of the Commonwealth of Pennsylvania." [The SKEPTICAL INQUIRER reported on the decision and published two pages of excerpts from Judge Jones's ruling in the March/April 2006 issue.]

Judging the Judge

Reflecting the ID movement's status as an integral part of the Religious Right, their mean-spirited attacks on Judge Jones have amplified right-wing screeching about federal judges, revealing their contempt for the judicial system they have long wished to

exploit on their own behalf. As Kevin Padian and Nick Matzke wrote in a commentary for NCSE, "DI immediately tried to 'swift-boat' the judge." (ID sympathizers were similarly enraged: harsh e-mails sent to Jones's office led federal marshals to place him and his family under guard for a short period.) Given the warmed-over creationism that was the only thing Dembski, Meyer, and Campbell could have offered in court, they would have needed either a political partisan or a fool on the bench. Antics such as the "Barking Forrest" interview suggest that DI regarded Judge Jones as the latter. One of Dembski's regular *Uncommon Descent* bloggers apparently regarded him as both.

Dembski declined to comment on his blog when the opinion was filed: "I have little to add to what I wrote in September, so I'll just leave it there." On September 30, he had calculated probabilities for various outcomes: (1) 20 percent that Jones would uphold the ID policy; (2) 70 percent that he would overturn it but leave the "scientific status of ID" unchallenged; and (3) less than 10 percent that he would both overturn the policy and rule ID unscientific. He hedged his bets by appealing for intelligent assistance: "I trust that Providence will bring about the outcome that will best foster ID's ultimate success." Blogger "DaveScot" urged optimism: "Have more faith, Bill! This is all about Judge Jones. If it were about the merits of the case we know we'd win. It's about politics. . . . Judge John E. Jones . . . is a good old boy brought up through the conservative ranks . . . appointed by GW hisself. . . . Unless Judge Jones wants to cut his career off at the knees he isn't going to rule against the wishes of his political allies." Post-verdict, however, Scot shifted from cocksure confidence in the "good old boy" to insults. When *Time* magazine named Judge Jones one of 100 "people who shape our world," Scot offered some unflattering comparisons: "The magazine who made these men 'Man of the Year'—1938–Adolf Hitler; 1939–Joseph Stalin; 1942–Joseph Stalin; 1957–Nikita Krushchev; [and] 1979–Ayatullah Khomeini—now brings you Judge John Jones as a 2006 Honorable (pun intended) Mention." Dembski responded appreciatively: "Thanks, Dave, for contextualizing this milestone in our proper appreciation of important personages. . . . What a crock." (Of course, *Time*'s Person of the Year designation is not an honorific title but an assessment of the designee's influence on the year's events.)

In a December 20, 2005, post on DI's *Evolution News & Views* blog, CSC associate director John West sniped, "Judge Jones . . . wants his place in history as the judge who issued a definitive decision about intelligent design. This is an activist judge who has delusions of grandeur." DI then hastily self-published a book, *Traipsing into Evolution: Intelligent Design and the Kitzmiller vs. Dover Decision*, charging that Jones "repeatedly misrepresented both the facts and the law in his opinion, sometimes egregiously." The nastiness of DI's attacks on the judge can be seen as directly proportional to his opinion's power and accuracy.

The Aftermath

Probably anticipating a future legal case, for which Jones's opinion would serve as a strong precedent and for which I might be called as an expert witness, ID creationists continue their efforts to discredit both Judge Jones and me. They employ their usual tactics: lacking scientific evidence for ID, they make things up or slander their opposition. DI's attacks on Judge Jones stem partly from his reliance on my testimony and pre-trial reports, as he indicated in his opinion: "Dr. Barbara Forrest . . . has thoroughly and exhaustively chronicled the history of ID in her book and other writings for her testimony in this case. Her testimony, and the exhibits . . . admitted with it, provide a wealth of statements by ID leaders that reveal ID's religious, philosophical, and cultural content." Consequently, CSC fellow Jonathan Witt has interwoven attacks on the judge with attacks on me: "Several newspapers . . . are highlighting Judge John Jones's spurious determination that intelligent design is creationism in disguise. They're accurately reporting the judge's opinion here, for his decision reads like a condensation of atheist-activist Barbara Forrest's mythological history of intelligent design. . . . In following Barbara Forrest's fallacious reasoning and mythological history of intelligent design, Judge Jones has erred badly."

On April 12, 2006, presenting long-discredited pro-ID arguments at the University of Montana School of Law, CSC fellow and law professor David DeWolf complained that Jones "thought it was his job to declare what was orthodox in science . . . [and] to decide theological questions." Asserting that Jones's opinion "effectively targeted" DI as "the author of this Wedge Document," DeWolf lobbed a double *ad hominem*: "Judge Jones's reliance on the Barbara Forrest testimony in the trial makes the John Birch Society look rational." He also told the audience—falsely—that "there is a letter from Barbara Forrest, one of the witnesses in the Dover trial, a letter to an editor of a journal saying basically don't publish things from people who are advocates of intelligent design." At a May 5, 2006, luncheon we both attended at the Massachusetts School of Law (MSL), I asked him publicly whether he had seen this letter. He admitted—before an audience of his legal peers—that he had not. (The luncheon was held prior to a taping of MSL's television program, *Educational Forum*, and was attended by law-school faculty and administrators.) This time he was telling the truth: I never wrote such a letter. However, DeWolf continues to promote ID using the same debunked arguments that he and his ID associates used before the trial. In an article with former DI attorney Seth Cooper, he complains that Jones's ruling was "based upon evidence and characterizations of intelligent design that have been sharply contested by leading proponents of intelligent design." Yet, like Dembski, Meyer, and Campbell, neither DeWolf nor Cooper was anywhere in sight when they had a chance to defend ID in court.

The legal defeat of ID is forcing Wedge strategists to seek new markets for their creationism and to work their conservative Christian market more thoroughly. They are peddling ID abroad: DI has added international signatories to "A Scientific Dissent from Darwinism." Even during the trial, they held an ID conference in Prague. Domestically, Dembski has been reduced to riding the coattails of conservative pundit Ann Coulter, who devoted four chapters of her latest book, *Godless*, to attacking evolution. These chapters contain the standard creationist canards, but with Coulter's recognizable stylistic stamp: "Imagine a giant raccoon passed gas and perhaps the resulting gas might

have created the vast variety of life we see on Earth. And if you don't accept the giant raccoon flatulence theory for the origin of life, you must be a fundamentalist Christian nut who believes the Earth is flat. That's basically how the argument for evolution goes." Coulter credits her ability to write these chapters to "the generous tutoring of Michael Behe, David Berlinski, and William Dembski, all of whom are fabulous at translating complex ideas." Dembski acknowledges his assistance: "I'm happy to report that I was in constant correspondence with Ann regarding her chapters on Darwinism—indeed, I take all responsibility for any errors in those chapters." He has dubbed Coulter "the Wedge for the masses."

These tactics by DeWolf and Dembski highlight the bankruptcy of ID and the blustering cowardice of its leaders, who must capture support with brazen deceit and sarcastic punditry. The trial was Dembski's moment to shine, to explain on the legal record why ID is a "full scale scientific revolution," as he wrote in *The Design Revolution* (InterVarsity Press, 2004, p. 19). Instead, plaintiffs' witness Robert Pennock read to Judge Jones Dembski's statement regarding ID's revolutionary status—and then dismantled it. Ironically, Dembski had his arch-critics right where he wanted us—on the witness stand and under oath. He could have been there, implementing his strategy, helping to "squeeze the truth" out of us, "as it were." In November 2005, after the trial ended, Dembski posted on his "Design Inference" Web site a combined version of his May 11 and 16, 2005, "vise strategy" blog pages, labeled as a "Document prepared to assist the Thomas More Law Center in interrogating the ACLU's expert witnesses in the Dover case." He appended a list of "Suggested Questions," which, he wrote, "will constitute a steel trap that leave the Darwinists no room to escape." (It is worth noting that after his last question, Dembski conveniently noted that "with these questions, we don't need to get into the positive ID program—i.e., what ID is doing specifically to advance ou[r] understanding of biology. That will come out under cross-examination of our side.") But when he had an opportunity to witness firsthand how his trap would operate, he was nowhere to be found. He "escaped critical scrutiny" by quitting rather than face cross-examination. He is apparently $20,000 richer for it, however, marking yet another difference between us: whereas I served *pro bono*, Dembski charged $200 per hour and threatened to sue TMLC for payment for one hundred hours of work he claims to have done prior to quitting. In late June 2005, he told Canadian ID supporter Denyse O'Leary that TMLC had agreed to pay him.

After ID's dramatic, unequivocal defeat in *Kitzmiller*, Dembski's priorities remained remarkably consistent: "This galvanizes the Christian community. . . . People I'm talking to say we're going to be raising a whole lot more funds now." If failure is that lucrative, one can only imagine how well-remunerated he and his ID colleagues would be if they could tell the truth and back up their claims about "intelligent design theory."

Acknowledgement

I would like to thank Glenn Branch and Nick Matzke of the National Center for Science Education for their comments and suggestions.

Notes

1. According to Richard Thompson, TMLC had agreed to allow Stephen Meyer, as "an officer of the Discovery Institute," to have his attorney present but would not allow Dembski and Campbell "to have attorneys, that they were going to consult with . . . and not with us." DI corroborates Thompson's statement about the offer to Meyer but says that Meyer "declined the offer because the previous actions of Thomas More had undermined his confidence in their legal judgment."

2. In addition to Rothschild, the primary attorneys were Stephen Harvey, Thomas Schmidt, and Alfred Wilcox of Pepper Hamilton; Witold "Vic" Walczak of the Pennsylvania ACLU; and Richard Katskee of Americans United for Separation of Church and State. Other attorneys who were not in court helped with pre-trial preparations.

3. A document is available on the Discovery Institute Web site, "The 'Wedge Document': 'So What?'" which the DI falsely claims was "originally published in 2003." But it was written in response to my book, which was published in January 2004. The document's properties show that CSC associate director John West created it on January 8, 2004, and the Internet Archive shows no such document on the DI Web site at the end of 2003. It does show a page with a link titled "What Is the Wedge Document?" that's dated February 10, 2004, indicating that the document was on the site at that time.

4. Despite the fact that Carpenter played no real role in the trial, he wrote an article for the February 2006 *American School Board Journal*, titled "Deconstructing Dover: An Expert Witness for the District Shares Lessons from 'Scopes 2005.'" In this article, he implements DI's deceptive strategy of trying to disconnect teaching ID from "teaching the controversy about evolutionary theory" (code talk for teaching ID) and offers "lessons" for school boards: "For school board members interested in 'teaching the controversy' about evolutionary theory, the lessons here are clear: Conduct the public's business in and with the public. Make sure your policies are justified with a clear and secular purpose. Neither officially advocate nor prohibit intelligent design. Seek out and pay attention to expert advice" (pp. 21–22). School boards would be well advised to ignore Carpenter's article and steer clear of teaching this nonexistent controversy in any form. As an "Education Correspondent" for Focus on the Family (FoF), Carpenter also wrote what appear to be variants of the *ASBJ* article for FoF's *Citizen* magazine.

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Note about References

For space reasons, most of the author's seventy endnotes, totaling the equivalent of 2,750 words, have been omitted from this printed version, with her approval. Instead, four of the notes and a short selected bibliography she prepared appear at the end. An electronic version of the article with all of the author's endnotes, most with hyperlinks for opening full texts, is on CSI's Web site at www.csicop.org.—*Editor*

Strange Visions

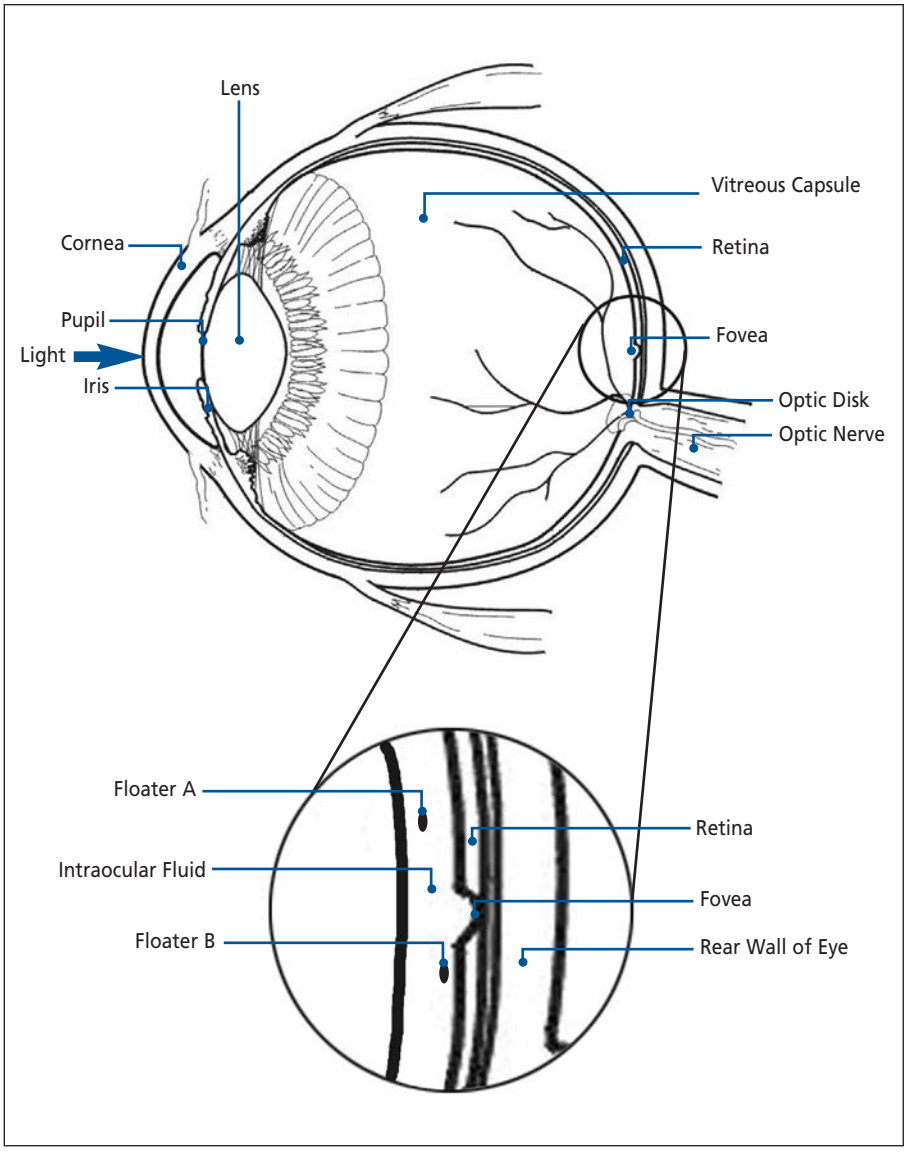
Haloes, Dust Storms, and Blood on the Walls

Unusual events within the eye such as the tearing of retinal capillaries or the detachment of intraocular structures may cause visual phenomena that have sometimes been attributed to supernatural sources.

A. CHARLES CATANIA

For centuries, strange visions have been taken as evidence of paranormal phenomena. The stimuli that may be their sources have typically been sought and located in the external visual world. Illusions of perspective, for example, may sometimes make a downhill slope look like an uphill one, so that water seems magically to flow in the wrong direction. In the false recognition of random patterns, a recognizable face may be seen on a piece of toast or in a reflection from a tarnished window.

A less obvious source of strange visions is when something unusual occurs within the eye itself. When I experienced such an event, I had the good fortune to be well-prepared to



The lower image, a detail from the cross section of eye anatomy, shows floaters within the intraocular fluid. Floater A is farther away from the retina than floater B, and so will produce a blurrier shadow; it is also farther away from the fovea, where visual receptors are more tightly packed, and will look blurrier for that reason as well.

interpret what was happening. I now work in areas related to learning and language and behavior, but in my days as a graduate student in experimental psychology in the late 1950s my research included sensory systems and vision.

I knew, for example, that when light enters the eye, passing through the lens on its way to the retina, any opacity along the way will block the light, creating a retinal shadow. The closer the opacity is to your retina, the sharper the shadow will appear to you, and the shadow will be visible only in the eye that contains the opacity. If you see such a shadow, you can figure out which eye it is in by closing one eye and then the other.

The retina is the photosensitive lining at the back of the eyeball. It includes not only the light-sensitive visual receptors, rods and cones, but also blood supply and other structures. In fact, light entering the eye has to pass through some of these structures to reach the rods and cones. (This arrangement is often cited to rebut the claim that the eye was intelligently designed.) The cones are concentrated in the central part of the retina, in and around the fovea; they serve color vision and the sharp acuity of the central part of the visual field. The rods are distributed in the periphery; they are much more light sensitive than the cones, but they provide poorer detail and color vision.

Light is no longer involved if something happens at the level of the rods and cones or past them in the optic nerve or a visual area of the brain. Under such circumstances, you cannot figure out whether the problem is specific to a given eye by closing one eye or the other.

Blood on the Walls

On January 23, 2001, my wife and I traveled from our home in Columbia, Maryland, to her mother's retirement apartment near Lancaster, Pennsylvania. We arrived at about 11:30 A.M. I carried a moderately heavy bag with a shoulder strap, and as we entered the apartment, I heaved the bag from my shoulder to set it on the floor. Straightening up, I saw a stream of blood beginning to run up the far wall. As soon as I moved my head the blood moved with it. I covered my left eye and then my right eye and saw the blood only with my right eye uncovered, so I quickly concluded that something was happening inside that eye.

The blood was in sharp focus, so it must have been very close to my retina. Furthermore, images on the retina are inverted: light from above falls on the lower retina and light from below falls on the upper. The blood was running up the wall, so it must have been moving downward inside my eye. It followed that the blood was denser than the fluid within which it was moving. That puzzled me at the time, because the vitreous humor that fills the eyeball is thicker and more gelatinous than the aqueous humor between the cornea and the lens. I

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learned later, however, that the thinner fluids within the eye are not confined to the space in front of the lens.

Some years earlier, I had received laser treatment for a thinning of the peripheral retina in my left eye. I was therefore aware of the possible importance of seeing "floaters," dark spots or masses that are the shadows on the retina created by material drifting in the intraocular fluid that surrounds the vitreous capsule. Visual phenomena such as these or flashes of light may sometimes be precursors of retinal detachment or other problems that must be dealt with promptly.

I told my wife and my mother-in-law what seemed to be going on and sat down to telephone our medical center. While I waited to be connected to the ophthalmology department, I watched the blood in my eye darken and break into web-like filaments and go out of focus as it dispersed. Once I was connected, I explained my situation, and we discussed whether I should go to a local hospital or return to Maryland. The bleeding had stopped, and we agreed that it would probably be useful to be where my ophthalmological history was known. The earliest available appointment was in late afternoon. Even though the drive back would take about two hours, it would get us there in plenty of time, and I might have had to wait that long in a local emergency room anyway.

Since it wouldn't affect how soon I'd be seen, my wife and I decided to have lunch with her mother before we set out on our return trip. It was an impromptu arrangement, and my chair leg got caught on a rug as I pulled my chair up to the table. The chair jerked sharply as I freed it and the bleeding began again. It seemed as if a small hole had opened in midair near the far end of the room. The blood this time was a single narrower stream as it rose upward, and the hole from which it emerged gradually closed down and cut off the flow as I watched.

That vision changed the standards by which I judge those science-fiction special effects in which something abruptly materializes out of another time or space. In any case, this episode was much shorter-lived than the first one. It also suggested that I should avoid sudden, jarring movements.

Dust Storms

My wife drove, so I was able to take in the rural scenery of southern Pennsylvania and northern Maryland. It was a bright winter day with a clear sky and snow on the ground, and when we came to relatively open stretches of road, I could see clouds of dark particles in the sky. I covered one eye and then the other, discovering that the particles were visible only to my right eye. Furthermore, their swirling movement became more agitated when we went over rough portions of road and became fairly calm when the road was smooth. The most likely explanation seemed to be that I was seeing the individual blood cells of my intraocular hemorrhage, stirred up by the vibrations created as our tires met the road. But if I hadn't known better, I'd have thought it was a dust storm.

The ophthalmologist I saw that day examined the debris that had caused my visual events and said that the bleeding was probably from a torn retinal capillary in or near the macula or the foveal area of my retina, the central area of sharpest acuity. The bleeding had loomed large for me, but its capillary source in my eye was tiny. The bleeding had stopped long before, so he was unable to find it.

When I looked at someone who was in front of a bright background, such as the sky or a light-colored wall, that person seemed to wear a halo. As the person moved and my gaze followed, the halo moved accordingly, so I had to deliberately look elsewhere to separate the halo from the person.

Intraocular bleeding occurs under various circumstances. For example, in women, the rise in blood pressure during the contractions of childbirth may produce it. Those who experience it typically see a golden or yellowish coloration in the periphery of the visual field. It rarely occurs so close to the central foveal area that it clearly appears as a flow of blood.

The gelatinous vitreous capsule that fills the inside of the eyeball between the lens and the retina usually shrinks somewhat with age, and sometimes the capsule and the retina, normally separated by only a thin layer of intraocular fluid, adhere to each other in places. As the shrinkage separates the capsule from the retina, the chance increases that such an adhesion might cause a small retinal tear (see, for example, Eagle 1999). No treatment was necessary, but observation and follow-ups with my regular ophthalmologist were recommended. I was to discover that the visual phenomena had not run their course.

Haloes

Within a few days of my initial symptoms, I began to see a dark annulus or ring around my central area of vision. It too was in my right eye, so I assumed that something about the configuration of the area had led the debris to collect there in that way. Its most striking aspect was that when I looked at someone who was in front of a bright background, such as the sky or a light-colored wall, that person seemed to wear a halo. As the person moved and my gaze followed, the halo moved

accordingly, so I had to deliberately look elsewhere to separate the halo from the person.

Gradually, the halo effect waned. Over a few weeks, the ring shrank and blurred and became irregular as it moved to the right and slightly above midline. For about a week, its irregularity included two smaller rings on the top and upper right of the main ring and a very small ring at the lower left. It looked disconcertingly like a spectral Mickey Mouse, and of course whenever I tried to get a closer look it moved away from my gaze, maintaining its fixed position in my visual field. It continued to dissolve and blur and change its shape over subsequent weeks. Though now quite faint, it remains visible as I write this, roughly five years later.

When I was examined by my opthalmologist in my subsequent visits, he remarked that it was unlikely that the annulus could have been made up of debris from my hemorrhage. I should not have been surprised. After all, I had seen the blood moving upward, and so I had concluded that it was moving toward the bottom of my eyeball. Why should it have moved back up again?

The doctor instead suspected another unusual event: a posterior vitreous detachment, sometimes called a Weiss ring (Espaillat et al. 1999). Near the back of the eyeball, somewhat removed from the fovea in the direction of the nose, is the optic disk, the place where the neural processes from the rods and cones of the retina come together to leave the eyeball as the beginning of the optic nerve. The rods and cones themselves are absent at this location, so the optic disk is a blind spot. You can locate it in your visual field by closing one eye while looking straight ahead and moving your fingertip around along the horizontal edge of your visual field on the side of your open eye until you find a place where it disappears. Once that happens, you can get an idea of the size of your blind spot by watching your fingertip reappear and disappear as you move it slightly up and down and back and forth.

The optic disk differs from the retinal areas that surround it, and a ring of the vitreous capsule typically becomes differentiated along the boundary between the optic disk and the rest of the retina. Sometimes this ring breaks away and drifts around in the ocular media between the vitreous capsule and the inner walls of the eyeball. It is of roughly the same density as the intraocular fluid, so there is no reason for it to drift in any particular direction. In this instance, it seems to have drifted horizontally and come to rest neatly around my fovea. The foveal area, or macula, is in a slight concavity or pit at the rear of the retina, and perhaps that topography kept the ring in a stable position for a while. In any case, as the ring dissolved, it gradually lost its shape and moved away from the fovea.

Flashes and Crystals

My two unusual visual events do not exhaust the possibilities. Adhesions between the vitreous capsule and the retina can tug at the retina even if they do not tear it, and sometimes that tug is strong enough to excite the visual receptors directly, so that you see small flashes of light. You are most likely to notice such flashes when in dim lighting or when your eyes are closed, and you cannot tell which eye they are in. I had seen such flashes from time to time, especially around the time of the laser surgery for my left retina.

Another phenomenon, called visual migraine, occurs when constrictions of blood vessels or other events in the brain stimulate activity in the visual cortex. The most common manifestation of visual migraine is a crescent-shaped flashing pattern around the center of vision. It has a crystalline look and includes scintillating white facets speckled with bright colors. After its initial onset, it usually fades slowly over a period of a few minutes. I saw it for the first time about a decade ago and have seen it only a few times since then.

Rare Events Need Not Be Interpreted as Messages

My symptoms were improbable, especially in combination. According to my doctor, they are sufficiently few and far between that on average, an ophthalmologist might encounter a case like mine every few years. I had seen blood on the walls, dust storms, and people with haloes. Their precursors years before had been flashes and crystals, but these are more common than my more recent visual events. I did not at any point feel that I was chosen to receive these visions. But what if I had not known enough about vision to interpret them and had lived in a time or place in which there were no knowledgeable experts to consult?

The human eye has not changed very much over the past few millennia. Though rare, these sorts of visions must have appeared to many individuals throughout human history. What stories about their visions some of them must have told! It is a good bet that some features of those stories have come down to us in one form or another, even if we cannot say whether any particular report of blood or dust storms or haloes originated with intraocular phenomena instead of other sources, such as illusions or dreams or real events. Based on the things I've seen and what I know about their sources, however, I'd be pretty skeptical about any claims that such visions should be taken as signs of the paranormal.

Acknowledgments

I thank Dr. David B. Glasser for several very helpful discussions of my visual experiences and my colleague, Dr. Victor G. Laties of the University of Rochester Medical Center, for some guidance in exploring the literature on Weiss rings. I do not have the name of the ophthalmologist who first saw me after the capillary hemorrhage, but perhaps that is just as well. To both my surprise and Dr. Glasser's, he had not believed that the particles of my "dust storm" could have been individual blood cells. Yet the sizes of blood cells and of visual receptor cells are of a similar order of magnitude, so that the former can in fact cast visible shadows on the latter. Finally, I thank my wife, Constance Britt Catania, and not just for driving me home.

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Pep Talk

How to Get Rid of the Energy You Don't Need

Had a hard time getting up this morning? Haven't got much energy lately? Maybe you need an energy bar or perhaps a little pep talk? On the other hand, chances are you have too much energy and you need to get rid of some. That could be difficult; energy is so confusing.

WILLIAM H. BAARSCHERS

"Having energy" is a desirable attribute. It means health and happiness. Energy is about vitality, about how we feel. Unfortunately, energy is often very poetic and abstract. Essayist Susan Sontag wrote about "bleeding energies" (Andrews 1998), and Prometheus used "aethereal energy" when he made the earth (Ovid 1965). Dictionaries offer synonyms like *vigor* or *bounce*. Those are about how we feel, about getting things done. "I have no energy" means "I feel lousy." Energy we don't have is about our mood (Dinges 2001).

Some see energy in the mind-body connection (Weiss–Miller 1998). They look for "subtle energies" that affect our health and well-being (Krizhanovsky and Lim 2004).

Others pursue *vitalism*, the mysterious force that all living things are said to possess, a "vital principle" that cannot be measured with instruments (Humber and Almeder 1998).

However, it is in the things we eat that "vital force" becomes "energy." This energy has to do with physics and biology, and it *can* be measured. This energy represents the "capacity for doing work" (Parker 1989), and we find it in many things, including our food. Energy that represents the capacity to "do work" belongs in the world of biochemistry. The "how-do-you-feel" energy belongs in the mind, where it is difficult to measure. It fits better in the world of poetry and spirituality.

There is nothing wrong with using the same word for two different concepts. There are plenty examples in the English language, and the meaning is usually clear from the context. But health-book writers often mix these different kinds of energy into the same recipe, causing no end of trouble. That is why there are so many "energy foods" and "energy beverages" in the supermarket, to help us "get our energy levels [up]" (Childs 2001).

We cannot touch or see energy, yet it is so common in our language that we perceive it as a concrete entity, something we can "have."

How Many "Energies?"

Since "being energetic" is obviously a good thing, "eating energy" must be good for you. However, don't "eat calories," because calories make you fat. So we have a dilemma: eating energy is said to be good for you, but when the same thing is called "eating calories," it is not. Explaining makes it worse and leads to confusing language like "burning calories" and "caloric energy," which aims at explaining this mysterious relationship between energy and calories. Health writers don't explain what happens to these calories when they burn.

In poetry and religion, metaphor and symbolism evoke feelings or arouse passion or commitment. In science, precision with words is essential. Philosopher Paul Kurtz (1991) called it "linguistic and logical clarity," which demands that we do not confuse the meanings of words in different usages.

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The energy from the physics textbook is usually associated with motion: the *kinetic energy* of a moving body, and the *electrical energy* of electrons moving in a metal wire. We observe energy changes with the tools of physics and describe them in the language of mathematics. We measure electrical energy in watts or kilowatts and the *thermal energy equivalent* of fuels, like wood or porridge, in calories or kilocalories.

Energy is an abstract, mathematical concept that we can use for describing complex events. Energy is not a substance; it is a property of a substance or an object (Davies and Brown 1989). We cannot touch it or see it, yet it is so common in our language that we perceive it as a concrete entity, something we can "have." For describing conversions of energy from one form into another, we need words like *thermodynamics*, *entropy*, and *quantum mechanics*. *Entropy* and *quantum* are words that health writers especially like to toss into their recipes. They are fine ingredients for adding that special flavor of scientific respectability.

The *energy density* of food is the energy equivalent in kilocalories per gram. Carbohydrates and proteins represent four kilocalories per gram. Oils and fats are more energy-dense, at nine kilocalories per gram. Plants don't need to carry their energy resources around; their chemical energy is mostly in the form of carbohydrates. We must carry our stored energy with us, so the most efficient way for us to store that energy is as fat, which, as was stated previously, is more energy-dense. A surplus of that stored energy gets in the way, literally, of converting it into mechanical energy. Too much energy stored around our waist is the very opposite of vitality and vigor.

Energy density also relates to food processing. Starchy crops, from which most plant "waste" has been processed away, yield much more chemical energy per mouthful than the whole plant. Removing leaves and husks concentrates the chemical energy in food. With a few exceptions, most diet books do not explain this problem clearly (e.g., Pritikin 1998).

There is one unfortunate wrinkle. When nutritionists talk about nutrients, they don't mean *macronutrients*, like fats, proteins, and carbohydrates, they mean *micronutrients*, like minerals, vitamins, and other phytochemicals. The concept of *nutrient density*, the amount of a specific nutrient in a given food, relative to the energy provided by that food, supposedly helps us to look at the nutrient-to-calorie ratio rather than just looking at calories. However, figuring out the nutrient density of one food relative to a dozen nutrients requires a calculator and very carefully reading the label on the jar (Zelman and Kennedy 2005).

Counts and Balances

Discussions at the blurry end of the energy-food relationship often emphasize the importance of "balance" and "harmony." One health writer sees wellness as "the graceful dance of energy in balance" (Taub 1999). However, "balance" requires two

things—you can't play on the seesaw by yourself, so something must be in balance with something else. "Harmony," as a synonym, does not help. The question becomes: what is in harmony with what? In the language of science, we know that "balance" does indeed involve two entities. In physics, biology, or chemistry, nothing is in balance by itself. It can only be in balance with something else.

Fortunately, behind the fuzzy words, we find clear labels for the events that take place in our bodies. Breaking down larger molecules into smaller ones is called *catabolism*. The reverse, building larger molecules, is *anabolism*. Together, these chemical changes are our *metabolism* in action.

Balance, in nutrition language, is the important equilibrium of the amount of energy taken in as food with the amount converted into other energy forms, like mechanical energy, or with the amount used for fueling the chemical changes involved in our metabolism. Balance occurs when our energy intake is equal to our energy expenditure. When intake and output are unbalanced, one of two things happens: we either starve or we get fat (Simopoulos 1990).

Energy balance is all-important for successful weight control, which cannot be achieved without a reasonable level of physical activity. Exercise capacity is a reliable predictor for cardiac health (Balady 2002). If your favorite diet book does not pay attention to this crucial part of your energy balance, throw it out.

Human bodies are energy converters. Plants convert solar energy into the chemical energy, mainly associated with carbohydrates. We eat the plants and convert this chemical energy into other forms: electrical energy for transmitting nerve signals, heat energy for keeping us at an operating temperature of about 37° Celsius. Food energy is also used for building the chemicals that make up our bodies and breaking down chemicals we no longer need; it is also converted into mechanical energy for muscle movement, which in turn gets converted into waste heat.

We cannot "excrete" excess energy, like excess water or salt. The "burning" of fat is a metaphor for the oxidation of fat, somewhat like burning wood, although it happens at body temperature. It means that the energy associated with the fat is converted into another form, but that other form has to go somewhere. If it is used to move muscles, and generate heat, the energy from the fat is dissipated outside the body. So, fat "burns" only if there is a demand for another form of the released energy. Food energy that we don't convert into another form is surplus, and it has to be stored. Eating "special" foods or herbs does not help to "burn" fat if there is no demand for energy.

As long as we keep energy beliefs and food biochemistry each in their own domains, we have no problems. The believer accepts the first, and the skeptic measures the second. When we mix the two, we get, for example, the pseudoscience of the use of specific foods, or supplements, for improving our energy levels. Medical laboratories have no procedures for measuring "energy levels." We have no way of knowing whether they are high or low. Are these energy levels about thermodynamics or about us having a good day?

The "Quality" of Energy

Chemical energy, unlocked from carbohydrates and fats, is often needed quickly. Muscle cells use energy that is instantaneously available from other high-energy molecules. To drive such fast chemical changes, we need the highly efficient catalysts called enzymes. Some writers ascribe near-magical properties to them; they are said to be "alive," and we are not supposed to cook our food, so that we don't "kill" the enzymes (e.g., Cichoke 1999). However, most enzymes are quite specific. Enzymes that help an apple to ripen were made according to instructions in the apple's DNA to serve the chemistry of the apple. These enzymes don't give us a healthy blush, just a minute amount of digestible protein.

Health-related energy ideas readily move from thermodynamics into pseudoscience, and sometimes right into the paranormal.

Food that is "alive" is also the subject of another diet book, which suggests that all cultures, except "Western medicine," see energy as the vital force that flows through everything living in the universe (Taub 1999, 82). This leads to the confusing conclusion that fresh fruit, which supposedly is "alive," but consists of 80–90 percent water, somehow contains more energy than candy, which is nearly all sugar and gram for gram contains vastly more energy than fruit.

If you truly suffer from a lack of energy, in the nutritional sense, the advice to eat less protein, fat, and high-glycemic carbohydrates makes no sense at all (Weil 2000). Why reduce your energy intake if you suffer from a lack of energy? However, if you carry excess energy around your waist and you have little "get up and go," the advice is well worth remembering.

Beyond Physics

Health-related energy ideas readily move from thermodynamics into pseudoscience, and sometimes right into the paranormal. That is where disease, or a "lack of wellness," has to do with the "energy field" that surrounds our bodies. Disease is said to be a disturbance, an "imbalance" of that energy field, and adept healers can detect these "energy imbalances" by placing their hands above afflicted parts of the patient's body. An "energy transfer" from healer to patient constitutes the Therapeutic Touch by which "human energies can be directed" to heal (Krieger 1993).

Such energy fields are not in the physics textbooks, so a nine-year-old student decided to investigate. She showed that

two dozen Therapeutic Touch practitioners, who agreed to participate in a simple test, could not detect the presence of the "energy field" around her hand near theirs. Her report was published in *The Journal of the American Medical Association* and promptly criticized by many believers (Rosa et al., 1998). Criticisms varied from flawed methodology to the assertion that "it doesn't matter as long as it benefits the patient." But the experiment did not address these issues. It was not even about whether or not such energy fields exist. The question was whether such energy fields can be detected by practitioners who say they can. And the answer was no. The author's rebuttal to the criticisms mentioned the challenge to show, under testable conditions and with a one million-dollar award, that such energy fields actually exist (Randi 2006). At the time of this writing, this award remained unclaimed.

Things become even stranger in the field of "bioelectromagnetic" therapies. This story starts with the well-known phenomenon of north-south polarity in magnets. Somehow, this magnetic polarity gets morphed into positive and negative energy, and we are led to believe that the Chinese concept of positive and negative *qi* follows naturally from Physics 101. What could negative energy be? Would it be analogous to negative weight? Would negative energy levitate us straight into science fiction? Clearly, "negative energy," whether called *qi* or something else, is a matter of belief. It does not belong in the science of health and nutrition.

These attempts to press a scientific stamp of approval on Eastern philosophic thought can be expanded endlessly. Energy conversions are a part of physics known as thermodynamics, which is governed by the laws of thermodynamics. The first law, about the conservation of energy, readily leads to "balance" and "constant energy levels," and we get the impression that the story is about elementary physics, while in actual fact, it is about a belief system or about a metaphoric meaning of the word *energy*. It is important to understand that ideas about "balancing energy" and about "blocked" or "stagnant" energy flow come from philosophical and spiritual approaches that are common in so-called vernacular health-belief systems, where "energy imbalance" is seen as the cause of many health problems (O'Connor 1995).

Nevertheless, energy concepts that are clearly outside the world of physics cannot be summarily dismissed. For example, an herbalist, who calls energy an "ambiguous" or "intangible" element of life, and discusses the herbs to improve it, is obviously addressing the issue of mood, of "feeling energetic" (Foster 1996). Dried herbs contain very little chemical energy such as starch or fat: their calorie equivalent is virtually zero. Using herbs to increase chemical energy intake is undoubtedly an exercise in futility.

But the effects of some of these low-energy herbs on our perception of well-being is well known. Their effects may have to do with energy supply to the brain in the form of glucose (Fernstrom 2001), or with facilitating other metabolic conversions. But when the label on these stimulants claims that they "promote long-lasting energy" and "support healthy levels of energy," remember that such claims, although allowed by the FDA, do not involve counting calories.

The frequent use of this terminology in modern diet books is clearly an example of what David Morrison (2005) recently called "framing the issue." It is therefore important that we see where the science ends and the belief systems begin.

Clearly, the ambiguous or intangible thing that we call energy is a rich source of inspiration for authors who like to dress their stories about calories in more romantic language. At worst, such language leads to pseudoscience. At best, fuzzy words obscure the simple rule that the only way to get rid of our surplus chemical energy is to convert it to thermal and mechanical energy (Laird, Birmingham, and Jones 2002). In other words, we don't need poetic language or "subtle energies" for turning fat into sweat. We just have to go down to the gym and do it . . . although that may require a little pep talk.

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Mass Hysteria at Starpoint High

Though mass hysteria is alive and well in the twenty-first century, it remains an unpopular diagnosis. In the face of compelling evidence to the contrary, it is often denied on emotional grounds as a phenomenon that happens only to others.

ROBERT E. BARTHOLOMEW and BENJAMIN RADFORD

What's in a name? That which we call a rose
By any other name would smell as sweet. . . .

—*William Shakespeare*

In the twenty-first century, there is a new bogeyman lurking in the same shadowy underworld that was once the domain of ghosts and goblins: mass hysteria. Phantom odors, mystery illnesses, and terrorism scares are undermining science and costing businesses and workers millions of dollars in lost productivity and wages. Known by the more formal (and politically correct) term *mass psychogenic illness*, mass hysteria refers to the rapid spread of illness signs and symptoms without any biological basis.

Mass hysteria is a serious, unrecognized problem that creates a financial burden on responding emergency services, government agencies, and the affected school or work site (which may be closed for days or weeks). Taxpayers must often shoulder the burden while public-health and environmental officers investigate. Fear and uncertainty may also lead to other anxiety disorders and stress-related health problems. There are many recent examples.

- In mid-December 2005, in the war-ravaged Republic of Chechnya, dozens of schoolchildren were stricken with breathing difficulties, headaches, and numbness amid rumors that they had been deliberately exposed to nerve gas as retribution for the school massacre in Belsan that killed over 300 in 2004. As a result, schools were closed, political tensions rose, and medical specialists from Russia were mobilized. A Chechen government commission concluded that the symptoms were psychosomatic, resulting from "intense psychological pressure caused by lengthy hostilities in the republic" (Mosnews.com 2005).

- Throughout 2005, a mysterious odor at the West Cedar Elementary School in Waverly, Iowa, was blamed for fatigue, headaches, itchy eyes, and dry throats in about 10 percent of the student body. After the school district spent $170,000 trying to find the cause, experts from the Environmental Protection Agency and Iowa Department of Public Health reported that they could find nothing out of the ordinary. EPA spokesman Craig Crable said that every test "available to science" was negative. Despite this, a survey of 131 parents found that 41 percent still wanted their children relocated (Spannagel 2005).

- On December 5, 2005, twenty-nine students were sent home from Ridge Meadows Elementary School in Wildwood, Missouri, after mysterious red blotches appeared on the upper bodies of students and several faculty members. The school was closed the next day, and a disinfectant team sanitized the building; but when classes resumed two days later, two new cases were reported. The cause was never found (Shapiro 2005).

Incidents similar to those at Ridge Meadows often prove to be mass psychogenic illness. One incident investigated by scientists took place on February 22, 1982, when two fourth graders at a West Virginia school complained of itching and rashes. By noon, thirty-two students were affected, and the number later jumped to fifty-seven. Medical exams and tests of the air, water, and food were negative, as was an examination of the school grounds. Based on interviews with the victims, doctors found that after the first two high-profile cases, symptoms spread by suggestion. A student would first hear of an existing case, then develop an itch—only then did the rash appear, and only on parts of the body that were easily accessible to the hands (forearms, abdomen, neck, shoulders, and middle and lower back). Investigating physicians noted that during exams, "children were actively scratching. . . . Several children who were surreptitiously observed a half hour after the interview exhibited no scratching, and their rash disappeared." The rash also disappeared when students left the school or during recess, and returned once they reentered the building. The school's small size and high pupil-interaction rate in the halls appear to have contributed to the outbreak (Robinson et al. 1984).

A similar outbreak of itching and rash occurred in South Africa in February 2000, affecting more than 1,400 students in thirteen schools. Students reported itching upon entering the school grounds; only a tiny fraction said that the itching continued when they returned home. The incident occurred amid stories that the itching was caused either by Satanists or by itching powder that had been placed in the bathrooms. Interviews and questionnaires determined that the spread of symptoms occurred by line of sight after observing others scratching (Rataemane et al. 2002).

Schools aren't the only area where mass hysteria has recently taken a toll. In February 2005, a chemical leak was blamed for nausea, heart palpitations, and dizziness that struck down fifty-seven workers near the Virgin Blue terminal at Australia's Melbourne Airport. The victims quickly recovered, and no leak or toxic agent was ever found, but the shutdown cost Virgin an estimated $3 million and disrupted air traffic across the continent. An investigation concluded that the cause was mass hysteria (Bartholomew 2005).

Writing in *The New England Journal of Medicine*, Timothy Jones says that he has heard similar "war stories" from colleagues, suggesting that hysteria is underreported (Jones et al. 2000). In fact, the case that Jones and his colleagues investigated—the sudden illness at Warren County High School in Tennessee in 1998—is typical. Eighty students and nineteen staff members were taken for treatment after a teacher detected a "gasoline-like" odor in her classroom. At first, only a few students reported smelling the odor and feeling ill, but then the fire alarm sounded as scores of police and rescue personnel from three counties converged on the school. In full view of the evacuees, the first teacher who was stricken and several pupils were loaded into ambulances and rushed to hospital. Soon more students reported headaches, dizziness, nausea, drowsiness, tightness in the chest, and difficulty breathing.

Several days later, a second, similar outbreak took place. In all, 170 students and teachers were affected. A questionnaire found that symptoms were associated with being female, "seeing another ill person, knowing that a classmate was ill, and reporting an unusual odor at the school" (p. 96). The odor in the school—and the massive, rapid response to the scene by emergency personnel—appear to have further heightened anxieties.

An army of personnel from government health agencies conducted an array of tests on the building and the students.

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Blood and urine samples were taken, as were 220 air samples, five water samples, eight wipe specimens from a variety of surfaces, and soil tests. All of them came back negative. The estimated cost of emergency care alone was $100,000, and the school was closed for two weeks (Alligood 2000). After the "mass hysteria" diagnosis was published, many locals were upset, and devised elaborate alternative theories (Paine 2000). Part of the problem is that no one wants to be labeled hysterical. When Dr. Joel Nitzkin accurately diagnosed mass hysteria at a Florida elementary school in 1974, he became the subject of community wrath and even death threats (Nitzkin 1976). More recently, with the publication of Elaine Showalter's book *Hystories* (on the prevalence of modern-day hysteria, everything from Gulf War Syndrome to child sex-abuse panics fostered by unwittingly encouraged false memories), the author received threats. Even noted psychologist (and CSICOP fellow) Elizabeth Loftus received hate mail after arguing there was an American epidemic of false child sex-abuse reports. She didn't hire a bodyguard, though she bought a gun and took up target practice (Abramsky 2004).

But what is hysteria? Simply put, it is the conversion of psychological stress into symptoms that mimic illness. In 1994, the American Psychiatric Association renamed the phenomenon, opting for the more politically correct *conversion disorder*—a term devised by Sigmund Freud to describe the transformation of emotional conflict into physical symptoms. Weighed down by heavy political baggage from widespread misuse of the term over the past two centuries (especially to stigmatize women), it was deemed that a name change was in order. Yet *hysteria* remains as popular as ever, as evidenced by its continuing widespread use in medical and psychiatric journals. The public often misuses the term to describe overreactions to everything from environmental gloom and doom ("green hysteria") to drug use in baseball ("steroid hysteria"), and share-market crashes ("Wall Street hysteria"). Further, when a person, especially a female, is emotionally distraught, she is sometimes described as hysterical. Of course, rarely are any of these people suffering from actual, clinical hysteria—hence the widespread confusion and upset over the word.

Tense Times at Starpoint High

In 2004, Starpoint High School, in Niagara County, not far from Buffalo, New York, gained a reputation for being a "tainted" school after a series of health scares. In February, a Spanish classroom was closed for over a week after parent complaints that one of the students was made ill by a substance that smelled like rotten eggs. Some theorized that it was mold contamination, though no cause was found. In September, a math classroom was shut down after students and teachers reported smelling an ammonia-like odor. Again, nothing harmful was found (Nemeth 2004d), though rumors began to abound that there was "something in the school."

Within this backdrop of fear and uncertainty, by mid-December, events began to escalate. On Tuesday morning, December 14, fifty-two chorus members were rehearsing Christmas carols in the auditorium, preparing for a big

Starpoint High School, near Buffalo, New York. Photo by Jennifer M. Griffith.

holiday concert that evening. At 9:20 A.M., a student felt ill. Before long, more and more chorus members began to feel unwell. Within an hour, thirty-one were complaining of dizziness, headaches, nausea, and feelings of flushness and lethargy; at least one student vomited. Some students noted a strange odor. Amid concerns of a possible bioterrorism attack, an army of response teams converged on the school: state police, FBI agents, officials from the State Department of Environmental Conservation, firefighters, ambulance personnel, and other first responders. Hazardous materials specialists wearing "space suits" and breathing apparatus were also dispatched. The students were rushed to local hospitals and the rest of the school was locked down and eventually evacuated. Those affected quickly recovered and were released within hours. Environmental tests at Starpoint were conducted by a private firm, and a separate team of experts on hazardous materials from Niagara County. All tests were negative. When the school reopened on Friday, December 17, the matter remained unexplained and no cause for the illnesses had been pinpointed. As a result, there were 308 student absences (Nemeth 2004a).

On January 10, press reports cited local fears that Starpoint was wedged between two former toxic dumps that may have been responsible for the "mystery illnesses" (Nemeth 2005b, 2005c). (It is notable that the notorious Love Canal is located in the region, likely adding to the perception that unexplained illnesses may be the result of toxic waste.) Three days later, there was yet another health scare, as an ammonia-like odor was detected in three classrooms. More tests were ordered. Then, on Friday, January 28, school-bus diesel fumes were blamed for a rash of nausea and headaches among students. Superintendent C. Douglas Whelan theorized that the fumes didn't dissipate in the near-zero temperatures and were sucked back into the building through the air-vent system (Lindsay, 2005). But surely on cold mornings, hundreds of schools in northern states and throughout Canada let their buses idle so they don't stall—and yet none report mass illness. Why Starpoint?

When pressed for an explanation, Starpoint school officials initially speculated that the chorus members "were overcome by the heat of the lights in the auditorium." This is possible, but doesn't answer the question: why Starpoint? Why the chorus? Thousands of chorus rehearsals are held across North America each year, during which students practice for their

upcoming concerts under hot lights and they don't fall ill in droves. When the "hot-lights" theory proved untenable in light of other incidents at the school, the "stale-air" hypothesis was evoked. On January 7, results from the initial tests on the school's auditorium and its air filter were released. The report stated: "No unexpected particles were identified in significant quantities" (Chopra 2005, 7). An analysis of clothing worn by students during the episode turned up nothing unusual. The report concluded that "there is no air quality factor that has been identified by the testing . . . that can explain or point to a cause for the incident that occurred at the Starpoint High School Auditorium" (Chopra 2005, 8).

Ever-increasing Circles

A week after the Starpoint choral incident, twenty-six pupils and four teachers at the nearby North Park Middle School in Lockport suddenly fell ill with similar symptoms, only to quickly recover. Under pressure to explain what happened, school officials suggested that low levels of carbon monoxide were given off by the boiler and the weather conditions were just right (or wrong) to allow the gas to be sucked back into the ventilation system. This is such an unlikely scenario that exhaust from a flying saucer may seem more plausible. Thousands of schools operate under similar conditions each day in North America during winter without apparent outbreaks of sudden illness. Every one of the thirty people treated at area hospitals after the incident had carbon-monoxide levels within the normal range. Superintendent Bruce Fraser seized on the claim that some carbon-monoxide levels were slightly elevated but "well below the level of a smoker" (Westmoore 2005). Yet people are exposed to slightly elevated carbon-monoxide levels all the time and nothing happens—when crossing the road in traffic, walking in an underground car park, even standing next to idling school buses. The carbon-monoxide theory is wishful thinking. Fraser is quoted as saying that the flu situation may have worsened the students' reaction to the carbon monoxide. But what school doesn't have some illness going around, especially during the winter season?

Fraser conceded that some of the affected students "may have had their own situations aggravated when they saw other kids get sick" (Westmoore 2005). Given the negative test results, it may have been *entirely* anxiety—fed by rumors.

The Power of the Mind

An explanation of hysteria for the events at Starpoint and Lockport schools does not mean that their students are crazy or prone to overactive imaginations. Nor does it mean that it was "all in their heads"—the reactions were real, but they were also generated by anxiety.

The incidents at these schools are tantamount to a collective panic attack. Indeed, many panic-attack sufferers doubt their diagnoses and think they have heart problems or other maladies that the doctors somehow missed. They often seek second opinions—and third and fourth opinions. They may refuse to see psychologists or psychiatrists. By the same token, when environmental tests are negative, it is not uncommon for more and more tests to be ordered, or different consultants hired. Negative or inconclusive results aren't seen as evidence that the threat is not there, but instead that the tests are faulty or the sample isn't large enough. While those investigating should not give up after a few tests do not reveal a cause (false negatives do occur), the possibility of mass hysteria should be considered.

Under the right circumstances, any school can be the epicenter of an outbreak. Starpoint had developed a reputation for being a "sick" school. The earlier outbreaks of mysterious illness at Starpoint served as proof that there was something in the school making kids sick and kept the issue alive. The Lockport incident occurred just a week after the Starpoint "mystery illness," and the prominent newspaper and television coverage which ensued.

It is important to trust the scientific evidence and not compound the problem with exotic, implausible theories that are not supported by scientific investigations. Perhaps labeling outbreaks as group anxiety or collective panic attacks would reduce the stigma and controversy that often accompanies episodes. Often, the illness and symptoms are real enough, but the diagnosis is very wrong.

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Smart Scientists on Intelligent Thought (If Not Design)

MATT YOUNG

Intelligent Thought: Science versus the Intelligent Design Movement. Edited by John Brockman. Vintage Books, New York, 2006. ISBN 0-30727-722-4. pp. Paperback, $14.

Intelligent Thought is a collection of sixteen essays by contributors to the online magazine *The Edge*, and is edited by the literary agent and author John Brockman. Many of the chapter authors are household names, at least in my household: Richard Dawkins, Daniel Dennett, Tim White, Steven Pinker. The topic is timely, and the book is well written and well edited; the only infelicity I can recall is an incorrect use of the phrase, "begs the question."

Why, then, can I muster only two cheers? In part, because the book is not well organized and not entirely about intelligent design (ID) creationism; it is a collection of mostly unrelated essays presented as unnumbered chapters whose only connection is that they are bound in the same volume (and that Brockman, wearing his literary agent's hat, represents some or all of the authors). In addition, in a most serious omission, the book has no index and most chapters have no references—critical parts of any nonfiction book.

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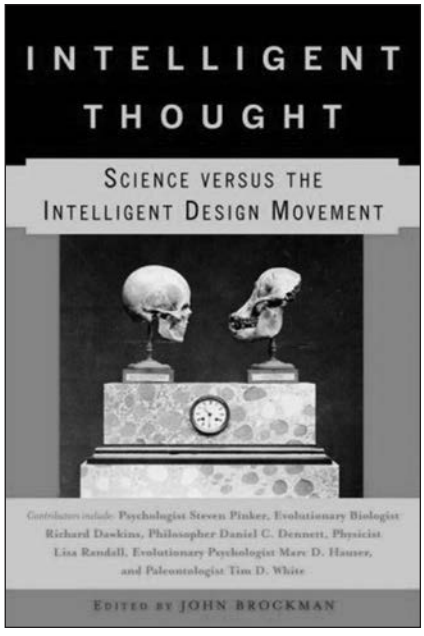

The opening essay by Jerry Coyne is right on task: Coyne shows why ID creationism is not scientific and distinguishes between the "strong" and "weak" forms, that is, between what ID creationists say to each other and what they say on the witness stand. Several chapters later, Daniel Dennett explains how the hoax (his word) of ID creationism is perpetrated, in part, by conflating design with purpose. Coyne's and Dennett's chapters are among the only chapters in the book with literature citations, though I thought each could have been beefed up considerably.

Richard Dawkins asks what we can learn from the search for extraterrestrial intelligence, or SETI. The chapter rambles a bit, but Dawkins makes the essential point that an ETI would have evolved by natural selection, whereas a deity (presumably) would not have; thus, ID creationism solves nothing, because it does not specify any of its designer's properties. Consequently, when we are looking for an ETI, we are tacitly looking for an entity with roughly human intelligence; when we are looking for the intelligent designer, we have no idea what we are looking for.

Although I have read a bit about Darwin and his famous voyage, historian Frank Sulloway's essay really brought home the fact that Darwin was a creationist when he set out. Observations are theory-laden, and Darwin made serious errors, such as failing to note on which island he had collected various specimens. The nonscientists on the ship made no such mistake.

Anthropologist Scott Atran's essay, "Unintelligent Design," notes some truly unintelligent designs in nature and then goes on to discuss religion. He did not convince me that religion is not adaptive behavior simply by providing some examples of rituals that are probably not adaptive; religion, as such, may well be adaptive, even if not all its rituals are. Like Atran, physicist Leonard

Susskind ascribes religious belief in large part to fear of death but, unlike Atran, argues briefly that it may be selected for. Susskind's is one of the weakest essays in the book, in part, because he documents almost nothing he claims. Susskind concludes, however, with the wise advice to write off the "benighted zealots who would prefer that intellectual history had ended in the fifteenth century" and try to convince the majority.

Steven Pinker's essay complements Atran's in a way, by showing that religion need not hijack morality, and further, that morality is not inconsistent with evolution and may well have a biological origin.

Paleontologist Scott Sampson's essay, "Evoliteracy," gratuitously blames reductionism for some of the ailments of education and recommends that we structure the science curriculum around ecology and evolution. Psychologist Marc Hauser decries blurring the boundaries between science and religion, and argues for adding new courses or new material on the history of a specific science and on the relation between that science and society. Both essays offer good recommendations that are unlikely to be implemented.

Tim White's essay on human evolution and Neil Shubin's essay on the transition from water to land suffered from far too much personal narrative. Biologist Shubin makes the interesting point that existing fish have many adaptations that might enable their descendants to live on land; tetrapods are interesting only because they succeeded. Presumably, if they had not, another form would have.

Lee Smolin, in "Darwinism All the Way Down," to some extent plays into the hands of the creationists by asking why the universe is improbably friendly to life. Who says it is? His answer to the question depends on his plausible but unproven multiverse theory and the application of natural selection to the individual universes in the multiverse. And quantum engineer Seth Lloyd's article on the universe as a computer also left me kind of cold. What matters is not how many "computations" the universe is making but, in Mark Perakh's terms, whether it can produce a meaningful message. Lloyd's chapter nevertheless had a nice section on William Dembski's misuse of the no-free-lunch theorems.

Theoretical physicist Lisa Randall takes a very conventional look at evolution but discusses problems with terminology, for example, the use of the word *theory* by scientists as opposed to laypersons. Stuart Kauffman discusses preadaptations (exaptations) and the impossibility of predicting the path of evolution to argue unconvincingly against both reductionism and ID creationism; he further states incorrectly that ID creationism predicts that in *no case* will an intermediate form be found. The rest of the essay pleads for a marriage between natural selection and self-organization, Kauffman's specialty, but does not clearly relate to ID creationism. Finally, in an especially weak chapter, Nicholas Humphrey writes about the evolution of consciousness, noting that consciousness seems otherworldly and asking why ID creationists have not seized on consciousness with a Paley-like analogy. I thought that his chapter in particular suffered from a lack of documentation and did not find it convincing, possibly because neither Humphrey nor I have the foggiest idea what consciousness is.

The book concludes with an excerpt from Judge John Jones's decision in the *Kitzmiller* case. If I wanted to be unkind, I might deduce that the book's major purpose was to appear while the buzz from *Kitzmiller* was still audible. The book is both good and original, but a lot of it is not devoted to ID creationism nor even to evolutionary biology or descent with modification. It is a hodgepodge with no real structure and no real point: a good beginning in Coyne's chapter but then no coherent body and no conclusion. Read it, but do not expect it to be a serious blow against ID creationism. □

MYSTERIOUS ENTITIES OF THE PACIFIC NORTHWEST, PART I
Continued from page 22

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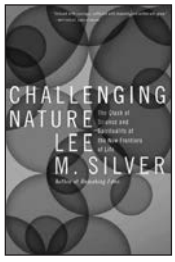
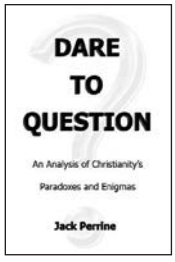
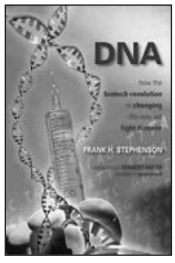


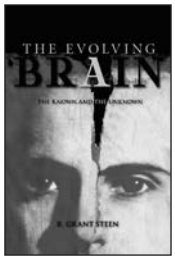
CHALLENGING NATURE: The Clash of Science and Spirituality at the New Frontiers of Life. Lee M. Silver. HarperCollins, New York. 2006. 444 pp. Hardcover, $26.95. A provocative look at the collision of science, religion, pseudoscience, and politics surrounding biotechnology. Molecular biologist Lee Silver (Princeton University), a hands-on scientist who has actually manipulated genes, here leaves the cloistered laboratory to explore a world of humanity whose worldview is dominated by soul and spirits. How does science proceed within that cultural context? Silver is a thoughtful advocate of biotechnology, pointing out that it is not a new process but is the best hope for preserving and protecting wilderness and wildlife—while feeding humankind. Our best hope, he says, comes not from banning biotechnology but from embracing it and guiding it.



DARE TO QUESTION: An Analysis of Christianity's Paradoxes and Enigmas. Jack Perrine. Inner Circle Publishing. 2004. 436 pp. Softcover, $21.95. An examination of the many concepts of Christianity that defy common sense or lead to paradoxical conclusions. Perrine scrutinizes more than a hundred myths and miraculous claims based on assertions of divine inspiration whose sources have gone through numerous translations, transcriptions, and interpretations. Written to identify problems involving classical interpretations and to offer alternative points of view, the book's objective is to encourage objective thinking.

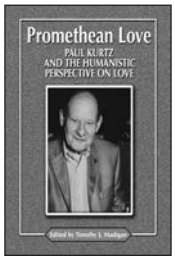


DNA: How the Biotech Revolution Is Changing the Way We Fight Disease. Frank H. Stephenson. Foreword by Herbert Boyer. Prometheus Books, Amherst, N.Y. 2006. 300 pp. Hardcover, $26. From heart disease to AIDS, cancer, and diabetes, biochemist and lab researcher Frank Stephenson tells the story of how the tools of biotechnology (e.g. monoclonal antibodies, antisense, RNA interference, gene therapy, cloning, nuclear transfer, and stem cells) are being used to combat our most common afflictions. A primer on the biotechnology revolution for the layperson.



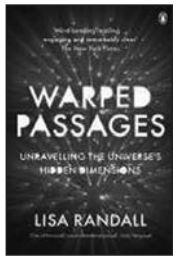
THE EVOLVING BRAIN: The Known and the Unknown. R. Grant Steen. Prometheus Books, Amherst, N.Y. 2006. 394 pp. Hardcover, $28. With 100 billion neurons, each of which makes perhaps 10,000 synapses, the human brain is arguably the most complex object known. What do scientists know about how this amazingly complex organ functions? A distinguished neurophysiologist (University of North Carolina School of Medicine) here provides a crash course on how the brain works. Topics include consciousness, unconsciousness, and brain death; learning, memory, and the role of genes; motivation, aggression, and emotions; and the plasticity of the growing brain. Steen also delves into such questions as: Where does creativity come from? What is personality? Can we distinguish between brain and soul?

FOLLIES OF SCIENCE: Twentieth Century Visions of Our Fantastic Future. Eric Dregni and Jonathan Dregni. Speck Press, Denver, Colorado. 2006. 128 pp. Softcover, $19. We didn't get jetpacks and personal-servant robots, but we did get some of the early twentieth century's futuristic utopian plans for your home and lifestyle. A visual delight, this book reproduces in glossy color dozens of imaginative and speculative cover and inside illustrations from science-fiction magazines and publications such as *Popular Mechanics* and its predecessors that tried, not always successfully, to envision the future we now live in.



PROMETHEAN LOVE: Paul Kurtz and the Humanist Perspective on Love. Edited by Timothy J. Madigan. Cambridge Scholars Press, Newcastle-upon-Tyne, NE5 2JA, U.K. 372 pp. Hardcover, U.S. $69.99; U.K. £34.99. A collection of essays by numerous scholars, growing out of a conference on "the philosophy of love." Special emphasis is given to the work and writings of philosopher Paul Kurtz, described as the foremost contemporary defender of humanism as a worldview.

SASQUATCH: Legend Meets Science. Jeff Meldrum. Forge/Tom Doherty Associates, New York. 2006. 297 pp. Hardcover, $27.95. Meldrum was part of a team assembled for a Discovery Channel documentary on the Sasquatch question. An associate professor of anatomy and anthropology at Idaho State University, he examines evidence involving sound recordings, films, photos, skin-ridge impressions, and plaster casts. Don't expect debunking here. The tone is serious and respectful of Bigfoot claims, while claiming to be "the definitive summation" of the subject.



WARPED PASSAGES: Unraveling the Mysteries of the Universe's Hidden Dimensions. Lisa Randall. Harper Perennial, New York. 2006. 500 pp. Softcover, $15.95. A distinguished young professor of physics and leading expert on particle physics, string theory, and cosmology (her research of the past five years is the most cited of any physicist in the world) here presents a readable inquiry into the idea that there may be an extra dimension, in fact another universe, just a few inches away. She explores a raft of new concepts including parallel universes, warped geometry, and three-dimensional sink-holes. This is in part her own story of how she found herself immersed in these multidimensional topics and in part a story of particle physics and string theory, including the kinds of problems that extra dimensions might solve and the questions that are left wide open.

WORLDS OF THEIR OWN: Insights into Pseudoscience from Creationism to the End Times. Robert Schadewald. SangFroid Press, Excelsior, Minnesota (www.sangfroid-press.com). 2006. 240 pp. Hardcover, $22.95. An anthology of essays and articles presents a writer-investigator's lifetime of research into what we might call crank science: why some people extend their view of reality beyond factual evidence or deny common reality and create their own. Some of the topics: creationist propaganda methods, flat-Earth beliefs today, the end of the world, Immanuel Velikovsky's final interview, religious dogma versus science, science versus pseudoscience, how to see a perpetual-motion hoax, and a skeptical view of alternative energy. The writings bear Schadewald's unique stamp, combining skepticism, broad knowledge, interests in the idiosyncratic (e.g., hollow-Earth claims), wit and humor, and, as CSICOP Fellow John W. Patterson points out in the introduction, "a uniquely personal, often empathetic manner...."

—Kendrick Frazier

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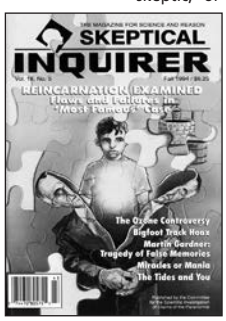

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MAY/JUNE 2004 (vol. 28, no. 3): Darkness, tunnels and light, *Woerlee* / Nurturing suspicion, *Mole* / The Cold War's classified Skyhook program, *Gildenberg* / The strange odyssey of Brenda Dunne, *Stokes* / Bridging the chasm between two cultures, *McLaren* / I am Freud's brain, *Garry and Loftus* / 'Visions' behind *The Passion*, *Nickell* / Belgium skeptics commit mass suicide, *Bonneux* / Psychic sleuth without a clue, *Nickell*.

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Bigfoot, Pluto, and ?

CHRIS VOLKAY

First, Bigfoot disappeared. The family of the gentleman who perpetrated a major hoax came forward after his death. No Bigfoot, just a guy stomping around in the woods with fake feet.

Then, recently, scientists took a vote and decided that poor, enfeebled, little Pluto, which always had trouble taking care of itself in the schoolyard, was going to be victimized once again and demoted to the status of non-planet. Sort of like a nonperson.

It gets one to thinking. Don't these things seem to always come in threes, like celebrity deaths? First one, then two celebrities die, and then the death watch goes up all across the nation, waiting for the trifecta to be completed. Who will it be? Tune in to *Extra*!

As we wait for the third shoe to drop in the Bigfoot, Pluto evisceration lineage, I'm offering one up now. Gee, there are so many to choose from . . . believe me, it was one of the hardest choices I've ever had to make.

Why don't we pick the biggest one? Sure, some people believed in Bigfoot and most that Pluto was a planet, but which is the most universal, the most powerful, the most consequential, and conversely, the most patently false?

Now hear me out, please, just hear me out before you ignite the torches and sharpen the pitchforks. I was going to say werewolves, because really, like Bigfoot, there isn't much evidence for their existence either. But you know what? Werewolves don't pass the test of being consequential enough. Hmm, what could complete the trio?

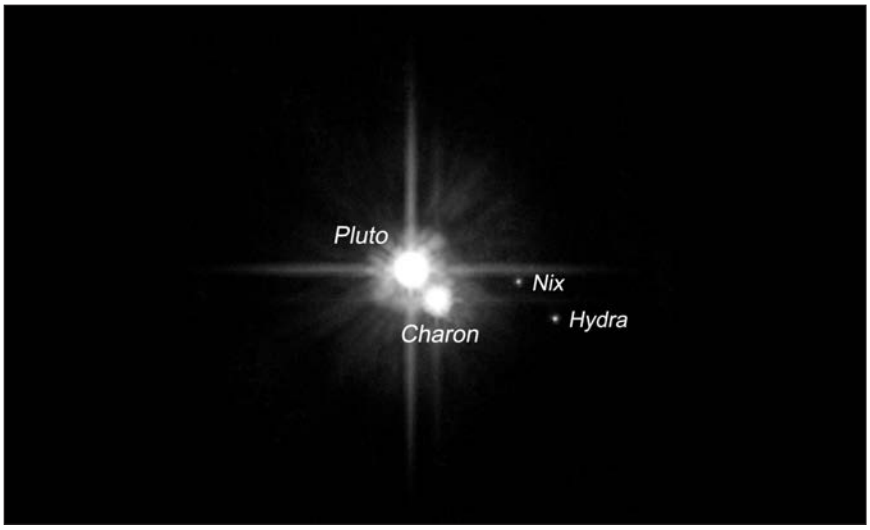
How about the gods? Not ours, but those of the *other* guys. We all know that their gods are false. Just made-up fantasies and delusions about this and that. Rivers of this and virgins of that—oh, please, come on! And look at all the damage they do. Those who believe in an afterlife and its rewards can and will do anything. And the Hindus and Buddhists with their reincarnation. Again, oh, come on.

While I'm sporting this most modest of all proposals, just think of the ramifications. Think of the incalculable lives we would save. If we could eliminate the religious insanity, what person would fly a plane into a building, or blow himself up in a pizza parlor? We could eliminate so much hatred, so much division, so much rage. Instead of turning people into soldiers, we could make them into citizens, human beings.

If we could eliminate religious insanity, what person would fly a plane into a building, or blow himself up in a pizza parlor?

They would have to give up their notions of reincarnation and the like, but think of the benefits. People actually living here and now, in this life. Think how much stronger they would be. Instead of simply existing until death mercifully whisks them away from this veil of crocodile tears, they would be forced to actually seize the reins of their

Chris Volkay contemplates the demise of the gods from Glendale, California.



This undated image taken by the Hubble telescope shows Pluto and its moons: Charon, Nix, and Hydra. The International Astronomical Union announced on August 24, 2006, that it no longer considers Pluto a planet, a status it has held since its discovery in 1930. The announcement reduces the solar system from nine planets to eight.

lives and make the best they could of them right here and now.

Revolutionary? Yes, yes, I like this idea better than the werewolves. Besides, there is so much more evidence for the existence of werewolves than for that of these imagined gods of the other guys. I mean come on, aren't their gods just their own fantasy creations to help them weather the storms of a short, nasty, and brutal life? All thinking people know it's true.

Oh, but wait, wait a sec. There's another test, a measuring stick, that needs to be brought to bear here. Damn.

We've got to include diversity, fairness, and equality, if we are to call ourselves truly fair, American. Gee . . . to that end, we're going to have to put our own god on the pyre along with the others. I mean, we can't possibly ask them to abandon their phony gods unless we are ready to relegate our own god to the round file as well. Painful as it is, it is something that simply must be done. After all, they would immediately point out that our god is just as, well, how does one put this tactfully, as *whimsical* as theirs.

There you have it. Bigfoot, darling little Pluto, and god—*all* gods. If this is how the current spate of debunking plays out, it would be a consummation devoutly to be wished for, as humanity, for the first time in its history, would finally be on the path to maturity. □

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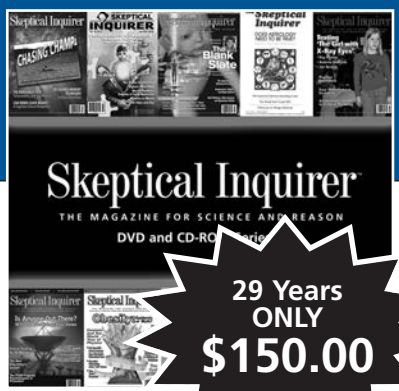

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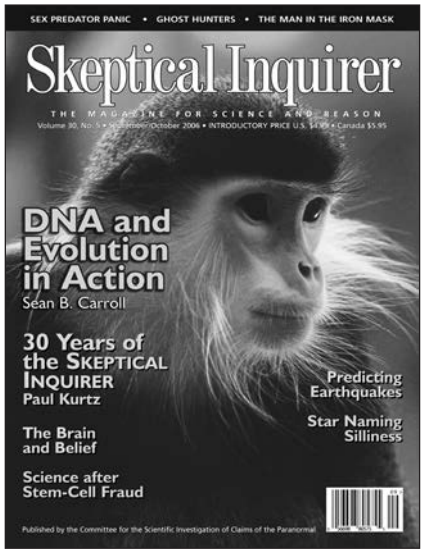
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The Skeptical Inquirer's Thirty Pioneering Years

Paul Kurtz's review of the pioneering years of the Skeptical Inquirer (September/October 2006) reminds us all of the positive impact CSICOP has had in establishing an effective antidote to runaway irrationalism and nonsense in our society and, indeed, the world.

Before 1976, I had to search long and hard for books by reliable yet readable authors who could explain why various theories were erroneous. Aside from Klass, Menzel, and Sagan on UFO claims, I found books by Joseph Jastrow and Martin Gardner helpful for claims in the soft sciences. But that's about all that existed for the general reader. Then, in the Spring/Summer 1977 issue of *The Zetetic*, I found Ray Hyman's "'Cold Reading': How to Convince Strangers You Know All about Them," after which the pace of my liberation from gullibility increased, knowing that similar articles exposing many other types of bunk the establishment avoided confronting were sure to appear.

Aside from offering reliable knowledge on fringe subjects, CSICOP and SI have promoted the values of responsibility and leadership, much like parents should, because the use of science and scientific reasoning are fundamental in explaining why ideas may be useful or useless. True, discussion of Santa Claus-like beliefs is more likely to attract an audience, but developing common sense and healthy skepticism is far more practical for us all in the long run, even if it may be less enjoyable at first.

Moreover, the involvement of like-minded scientists and investigators worldwide ought to increase the chances of long-range survival of what CSICOP pioneers have established these past thirty years.

Effective public education in science and scientific reasoning requires consistent leadership across the ages. And as U.S. President Harry S. Truman once stated, "Leadership is the art of persuading people to do what they should have done in the first place."

E.A. Kral
Wilber, Nebraska

As a subscriber to the Skeptical Inquirer and *Free Inquiry* over the years, and as a fan of CSICOP, I have been vaguely aware of the impact you have had in propagating and defending skeptical humanism.

However, in reading Paul Kurtz's recent essay, "Science and the Public: Summing Up Thirty Years of the Skeptical Inquirer," it dawned on me what a truly amazing job you and your fellow humanists/skeptics have accomplished during the past generation.

We are now living in an age in which religion is not only growing in political influence worldwide but threatens to usher in another epoch of "holy wars." That our current president believes he decries on the horizon a third "great awakening" of his own faith, while urging Americans to fight "Islamo-fascists" worldwide, does not bode well.

I suppose these dire developments might tempt one to question the influence of the skeptical-humanist movement. But I think that there are many skeptics, as well as moderate believers, who take heart from the calm, rational, and humanistic voice of the skeptics led by people like you.

As a retired college professor in a state bristling with religious zealots, but which also contains a strong countervailing movement among both believers and nonbelievers, I am hopeful that the spirit of the Enlightenment will hold the fanatics in check. And I am hopeful in part because of the influence of your organization. My wife and I have decided to change our will to include the New Future Fund as a beneficiary.

Keep up the good fight!

Chandler Davidson
Radoslav Tsanoff Professor of Public Policy Emeritus
Rice University
Houston, Texas

This letter is inspired by every article published in the Skeptical Inquirer. SI is a god-send (*sic*) in this age of bunkum, superstition, and wishful thinking. Its rational message needs to be spread. Let us each induce our local libraries to subscribe to this journal. My personal score to date is two libraries: one in Virginia and one in Florida.

Shipmates, spread the word.

Leo Shatin
(Professor of Clinical Psychiatry, retired, Mount Sinai School of Medicine)
Boca Raton, Florida

Professor Kurtz submitted that the Skeptical Inquirer and CSICOP should investigate other kinds of intellectually challenging and controversial claims, including biogenetic engineering, religion, economics, ethics, and politics. While the topics of interest to readers will naturally change over time, I hope that SI does not broaden so much as to lose its core.

I have read SI for over four years now, and I subscribed (and still do) chiefly for the scientific investigations, news and discussions on fringe/pseudoscience claims and the so-called paranormal, and the science-religion debate. I see this core as what makes SI a distinct magazine worth subscribing overseas for. If I want to read an intelligent scrutinizing of biogenetic engineering, religion, economics, ethics, or politics, I can buy *New Scientist*, *The Humanist*, *The Economist*, *The Philosopher's Magazine,* or *Prospect*, respectively. I am sure readers can think of other magazines, newspapers, journals, etc. that cover those topics as well. However, from the ones I can think of, they hardly cover any of what I regard as the core SI content, and certainly not to the same depth and quality of analysis. Where else could you read anything like Joe Nickell's brilliant "Investigative Files"?

Keep up the good work.

Glyn Bradley
Cheshire
United Kingdom

I want to assure Mr. Bradley and other readers that SI's gradual "broadening," which has been going on for years, will not be at the expense of our "core" topics, where we have—and intend to maintain—a unique niche.—K. Frazier, Editor

Three comments on Paul Kurtz's summing up of thirty years of CSICOP battling astrology. (1) The Mars effect is said to be most likely due to "biased data selection by the Gauquelins." But as pointed out in my reanalysis in the May/June 2002 Skeptical Inquirer, the Mars effect may be a social

effect with no need of appeals to data selection. I concluded that "data selection and fraud can be rejected because Gauquelin could hardly be selective or fraudulent about social effects he was unaware of." (2) CSICOP is said to have "encouraged" my tests of astrology, implying that without CSICOP, little would have happened. True, my articles have always received unfailing courtesy and consideration from SI's editors, but much of my more important work was finished well before CSICOP began. The real encouragement has come from associates on both sides of the skeptical divide who are still supportive and wonderfully argumentative after nearly thirty years of joint endeavor. (3) My results were "invariably negative" only in the sense that no useful effect sizes were found.

Also, the claimed truth of astrology is readily explained by the same cognitive biases that underlie proven invalid approaches such as phrenology. Unfortunately, this obscures the genuine role that astrology can play as an aid to counseling without itself needing to be true. You can find more on this at www.astrology-and-science.com.

Geoffrey Dean
CSICOP Fellow
Perth, Western Australia
Australia

Cheers for Predator Panic

The article, "Predator Panic: A Closer Look," by Benjamin Radford in the September/October 2007 SKEPTICAL INQUIRER was excellent, thought-provoking, and long overdue. It seems that a certain group of people is getting a great deal of mileage out of this overblown fear of "sex offenders" or "sexual predators" . . . and in my opinion, that group is none other than *law enforcement.*

With no real criteria of what separates the *real* sexual predators, those who commit violent offenses against children, such as murder, kidnapping, rape, sodomy, etc., from those who may be have committed mild misdemeanors such as "flashing," or "touching" (just an accidental brushing of the hand against the wrong "private part" can do these days), more so-called "sex offenders" will continue to be arrested, tried by biased courts, convicted, and sentenced to long prison terms meant *only* for the serious *violent* offenders. How locking up such innocent parties is "protecting the children" is a mystery.

While locking up more people for questionable "offenses" may make police detectives, prosecutors, and "tough-on-crime" judges happy—not to mention prison contractors and employees—it hardly serves the interests of society at large. Nor, as the article correctly points out, does such fear mongering by the media and law enforcement officials serve its original purpose, which is protecting the children.

I hope the SKEPTICAL INQUIRER will do a follow-up article on the "Predator Panic" soon, one which addresses the importance of distinguishing between serious sex offenses and lesser offenses, which cause no physical injury to a child and where no physical injury was even intended. Obviously, our law-enforcement officials need a reminder.

In the current environment of fear, many parents, grandparents, uncles, and family friends are nervous and even afraid to show physical affection to children in public or even in private, for fear it will be misinterpreted by someone. Things parents, grandparents, uncles, and family friends once used to do all the time with kids, such as rough-housing, tickling, swinging them around for rides, or giving them piggyback rides, are fast becoming less common. Not too many want to risk getting the accusing finger pointed at them simply because a child's or adult's hand may accidentally touch the wrong "private part" by mistake. How denying physical affection to children is supposed to "protect" them is also unclear.

Many thanks again to the SKEPTICAL INQUIRER for having the courage and the intelligence to publish this article and to Radford for writing it. As far as I'm concerned, "Predator Panic" should be read by every "lawmaker" across the nation, and by every citizen of this country who may one day serve as a juror. Jurors who make decisions based on intelligent reasoning rather than fear and ignorance may be far more likely to think twice before convicting an innocent person on nonexistent "facts" and flimsy excuses for "evidence." At least, one can hope so.

Susan S. Levine
Dale City, Virginia

Thank you so much for your article on sex-offender hysteria. I would like to point out yet another way that this threat is exaggerated and the panic is amplified. In many U.S. states, "sex-offender" crime statistics include people who have committed consensual sex crimes, such as prostitutes and their customers. (It's not just conservative "red" states, either—California is one of them.) People may disapprove of these activities. They may even believe the activities should be illegal. But they are almost certainly not what people have in mind when they picture a predatory sex offender that their loved ones have to be protected from.

And many laws that govern sex are so broad that they criminalize behavior that most of us would consider fairly innocent. For example, "statutory rape" makes many people think of a forty-year-old man molesting a twelve-year old, but it can also cover an eighteen-year-old girl and her seventeen-year-old boyfriend. And while "public indecency" often creates an image of an invasive, raincoat-clad flasher, it can also include college kids who get busted for skinny dipping at the local pond. As long as laws against consensual sexual activity are still on the books, statistics on sex criminals will continue to paint an absurdly inaccurate picture of how much of a threat we actually face.

Greta Christina
San Francisco, California

Evolution Education: Science Revels in Unknowns

In his Editor's Note in the September/October 2006 issue, Kendrick Frazier ruminated over a letter from a reader who was fed up with scientists who fail to address "unanswered" questions about evolution. Frazier lamented the writer's ignorance of evolution and applauded the writings of Sean Carroll, one of the new, effective voices bringing evolutionary thinking to the public. I am in full agreement with him here and welcome Carroll to the fray.

However, it strikes me that more is needed than educating the public about evolution and the mechanisms of evolutionary biology. There is a deeper difficulty that has gone largely unaddressed. The average layperson, unschooled in science, is seemingly unaware that the very foundations of a mature science are the unknowns, the questions to which we do not have answers. Frazier's letter writer was following a standard gambit of creationists, paranormalists, and other defenders of the fringe: pose "unanswered" questions as though they reveal that the standard model is somehow flawed.

Frazier did the usual thing. He sighed and then responded by pointing out that, in fact, the "problems" identified had already been worked out and posed no particular difficulties. I suspect that the recipient of this riposte was not particularly impressed. Most

likely, he was delighted that he managed to tweak a respected defender of evolutionary science and headed back to some creationist Web site to find another "problem that evolutionists haven't solved."

In addition to carrying the evolutionary science message outward, we also need to impress upon the lay public that scientists are not only not bothered by the existence of problems that haven't been solved, we revel in them. If there weren't such, the whole enterprise would collapse. The gentleman who wrote to Frazier might have been jolted awake if he'd realized that it is the evolutionary biologists who keep coming up with "problems that evolutionists haven't solved," not the creationists. The enigma is the engine of discovery; having all the answers is a death notice.

For many years, I taught a course titled "Parapsychology: A Critical Examination" and ended up being invited to engage in various debates with creationists, paranormalists, and other "fringers." The "how-can-science-explain-X?" gambit was a ploy I often encountered. I learned never to answer. Instead, I would redirect the discussion to how science is actually "done," to the importance of having an endless supply of currently unanswered questions nagging at us, forcing us to rethink matters, stimulating new studies, and encouraging innovative theory. I found that refocusing the argument in this manner was far more effective than simply answering the challenge with a sigh and a lament.

Yes, we need to educate folks in science, but it may be even more critical to educate them about how science is done.

Arthur S. Reber
Broeklundian Professor of Psychology Emeritus
Brooklyn College and the Graduate Center of City University of New York
New York City, New York

Language of Evolution

I applaud Susan Bury's article on the language used to describe evolution ("Tell It Like It Was," September/October 2006). Like her, I have often worried that the common usage ("something evolved to do something else") plays straight into the hands of those looking to discredit evolutionary theory. After all, as it is not true when stated that way, it is easy enough to shoot down.

More important, I find this usage makes it impossible to grasp evolutionary concepts without complex mental gymnastics. This is particularly the case with intuitively more difficult concepts such as kin selection. To give a slightly different example, the idea that you look after your sister because her children carry a quarter of your genes is not easy to relate to one's day-to-day experience of family life.

We are presenting these concepts in an environment often deeply hostile to the theory of evolution, and to people who for good evolutionary reasons, as Geoffrey Miller points out in *The Mating Mind*, ironically favor dramatic and entertaining stories over biological accuracy. We need to make sure that our descriptions of evolution are based on clear and accurate explanations that make immediate sense of people's experience, even if the common shorthand is appealing.

David Cox
Ovingham, South Australia
Australia

Quincey on Quantum Mechanics

I enjoyed Paul Quincey's recent article on quantum mechanics (July/August 2006), in which he took elements from Richard P. Feynman's view (expressed, for example, in his book, *QED*) and carried them even farther. I'm a professional physicist, so I found it interesting and challenging to take Quincey's insights and try to understand them in the terms to which I'm accustomed. I have to admit that I found myself not entirely agreeing with his conclusions on a point or two (mainly the uncertainty principle), but I consider that a minor quibble; on the whole, particularly in his discussion of how systems change over time, I thought he did quite a good job tackling a notoriously difficult subject, and he handled it well.

I think this article is a good companion to *QED* and Brian Greene's *Elegant Universe*, as well as the more adventuresome Feynman's original article on path integrals ("The Principle of Least Action in Quantum Mechanics," *Reviews of Modern Physics* 20: 367–387, 1948) and the graduate textbook, *Quantum Mechanics and Path Integrals*, by Feynman and Hibbs. Explaining difficult scientific concepts to lay audiences is an important public service, and I appreciate Quincey taking it on. I also hope SI will publish more articles like this, because science is like most other things: it's easier to spot counterfeits if you know the real thing.

Eric Chisolm
Los Alamos, New Mexico

Is Deception in Investigations Ethical?

I was dismayed to read in the September/October 2006 issue's News and Comment section ("Carla Baron, Psychic Detective? Not Quite") about the Independent Investigations Group (IIG) use of lying to discredit Carla Baron. The IIG audience plants made up stories about themselves and then used the fact that Ms. Baron failed to detect their fabrications as evidence that she is not, as she claims, psychic. There are always ways to test claims of the paranormal that do not involve dishonesty and deceit. Skeptics' use of lying and deceit only puts us in a bad light and gives ammunition to those who would discredit us. How can we expect people to trust us if we admit that we are willing to use deceit to achieve our ends? Perhaps we need a code of ethics for the conduct of investigations of claims of the paranormal and SI should refuse to publish the results of any investigation that does not conform to that code.

John P. Wendell
Kailua, Hawaii

Editor's note: We asked our Senior Research Fellow and SI Investigative Files columnist Joe Nickell for his views on the concerns expressed in the above letter. We share his thoughtful response with readers:

Regarding the letter about IIG's tactics with regard to "psychic" Carla Baron, I have repeatedly stressed ethical conduct in investigations; however, I agree with David Koepsell (SI, January/February 2006) that "where the intent of the investigation is to uncover an attempt at defrauding innocent people, a little trickery may be justifiable." Indeed, Koepsell was referring to some of my undercover work aimed at checking psychic and spiritualist claims.

I often saw proof of the old maxim that one must "set a thief to catch a thief" when I was an undercover operative for a famous private-detective agency. I watched from the inside of effective theft operations while those who naively thought they could avoid the "dishonesty" of undercover work advocated methods of security that were ineffective.

Long before Houdini, skeptics deceptively set traps for psychical claimants—as when one secretly smeared printer's ink on the neck of a violin that spirits were expected to play in the dark of a Davenport Brothers' séance of the 1850s; afterward, one of the Davenports had his shoulder besmeared with

ink, helping prove that the duo was slipping out of their confining rope ties to produce bogus spirit phenomena.

The great magician and psychical investigator Harry Houdini used false names and whiskers to enable him to enter séances and booby trap mediums' fake phenomena. Similarly, magician Milbourne Christopher adopted a false identity to test famed Lady Wonder the Psychic Horse and, by implication, her trainer, Mrs. Claudia Fonda. When Lady spelled the false name *Banks* rather than *Christopher*, the phony psychic trickery was exposed.

More recently, James Randi's mid-1980s investigation of faith healers had him and others adopting false personas to test the powers of the Rev. Peter Popoff and others. As homely "Bernice Manicoff," California skeptic Don Henvick was "healed" of six different diseases, including uterine cancer. "By these means," writes Randi, "he proved beyond any doubt that many faith-healers—Popoff among them—were obtaining information by subterfuge and then feeding it back as if it came from God."

Many paranormal claimants refuse to be tested under meaningful conditions, yet garner tremendous publicity with claims that are doubtful to say the least. I believe they invite surreptitious tests which—if they are genuine—they should have no reason to fear.

Joe Nickell
Amherst, New York

Reconciling Reductionism and Holism

I was pleased to see Massimo Pigliucci's discussion of reductionism and holism in your September/October issue. However, I do not believe it is satisfactory to set these two things so much against each other. Some years ago, I offered an alternative account of reductionism and holism that allows their reconciliation ("Reductionism and Holism Are Compatible," in *Against Biological Determinism*, Steven Rose, ed., London: Allison & Busby, 1982). I believe the argument given there, framed in terms of systems theory, still has some merit.

Briefly summarizing: in a multilevel analysis of any complex part of reality, it is desirable from the outset to regard a system as a triad (subsystem, system, super-system); this reminds us always to comprehend the thing we're studying in a dual manner: internally, by recognizing its component subsystems; externally, by locating it within the super-system of which it is a part. Reductionism is an account of a system in terms of its interior, holism an account from an exterior standpoint—the view from below and the view from above, respectively. These two views are unavoidable and inextricably linked: one could not even begin to make a reductionist explanation of a system without knowing what it is one is called upon to explain—what the system does within its context.

The old adage, "the whole is more than the sum of the parts," can nicely illustrate how the internal, reductionist perspective and the external, holistic perspective complement each other. To describe an organized system in the former case requires more information than just a description of the parts, since the informational structure by which those parts are assembled must also be described; in that sense, the reductionist description of a house, say, is more complex than a description of the bricks from which it is built. In contrast, to say that a totality is an *organized* totality is to say that there is a higher-level, external description of its function which is *simpler* than that of the parts.

For example, is a modern radio simpler than an early radio? Yes, in the sense that the user (external view) can tune it more easily; no, in the sense that, to effect that ease of use, the internal design must be more elaborate. Oft-recurring arguments about whether evolution makes organisms more or less complex need to be framed within a similar dual description, the two-part account of the evolutionary process—genetic variation and environmental selection—being an exemplary case of the internal/external dichotomy.

Allan Muir
Fron Deg
Llanfynydd
Wrexham
United Kingdom

The distinction between methodological reductionism and ontological reductionism was not discovered by Robert Brandon. Drawing distinctions between various types of reductionism is older than his book and is becoming increasing well recognized. In my book, *Reductionism: Analysis and the Fullness of Reality* (Bucknell University Press, 2000), I differentiated five types: ontological (the number of substances making up the world), methodological, conceptual, theoretical, and structural (related to the number of forces at world in the world). Others before me have, of course, also presented various typologies (e.g., Arthur Peacocke). Distinguishing different types of reductionism helps to clarify the discussions and brings out an important point: no antireductionist rejects the *analysis* of parts as a necessary step for understanding a whole completely; issues only arise when reductionists go further than analysis and *reduce* the reality of the whole or our understanding of it in one or more ways.

Richard H. Jones
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Man in the Iron Mask

Massimo Polidoro's article on the identity of the Man in the Iron Mask ("Behind the Mask," September/October 2006) does not offer any explanation which fits all the known facts of this mysterious prisoner's identity, namely:

1) His face, if revealed, could have been recognized by any Frenchman.

2) Louis XIV respected the prisoner sufficiently to afford him every comfort except his liberty.

Several years ago, I visited Monte Pinerol in Italy. The locals were intrigued to learn that I am a journalist, and several of them boasted to me that Monte Pinerol was the birthplace of the Man in the Iron Mask. Further, they cheerfully told me the story of his identity, which had been an open secret in Monte Pinerol for centuries. In separate conversations, four different residents of Monte Pinerol each told me almost verbatim the same account, although this proves only that the locals have had time to get their story straight. I have managed to verify some points of it as true. Here it is, minus a few details which I choose to hold in reserve:

Louis XIV's father, Louis XIII, was known to prefer the company of handsome young men to his wife, Anne of Austria. After fulfilling his regal duty and fathering an heir (the future Louis XIV), the king showed no further interest in his wife. She did, however, produce another child: Philippe I, Duke of Orleans. As Philippe grew older, it was noted that he resembled neither his mother nor the king. Philippe had Italianate features that were strikingly similar to the countenance of a certain Italian-born courtier in the French court: a young man who had been very kind and affectionate to the queen while her husband neglected her.

When Louis XIV ascended the throne in 1643, his mother, the dowager queen, was still alive and capable of suffering embarrassment. As Prince Philippe matured, and his portrait circulated through the kingdom, it

became obvious to a widening circle of citizens that the prince greatly resembled his mother's Italian courtier.

Louis XIV recognized that this man had given his mother many kindnesses, and he was accordingly grateful. But he could no longer permit the world to view the countenance of a man who, by his strong facial resemblance to Prince Philippe, revealed the shameful secret of the dowager queen's infidelity. Therefore, by royal whim, the courtier was imprisoned for life . . . but he was given every comfort, except the right to display his face: the Man in the Iron Mask.

F. Gwynplaine MacIntyre
Glasgow
Scotland

Massimo Polidoro replies:

This is an interesting theory for the MIM but not better than others. I have been to Pinerolo several times, but this is the first time I've heard such a story. I think that the foremost experts on this subject, Jean-Christian Petit-Fils and John Noone, whom I quote in my article, are on the right track.

Flags of Iwo Jima: Correction and Apology

In my column in the November/December 2004 issue, "My Wife—and the Dialectics of External Historicity," I wrote that Associated Press photographer Joe Rosenthal had asked Marines on Iwo Jima to raise the American flag over Mount Suribachi a second time so that he could photograph them in what I said was a posed shot. Several people wrote in to challenge my claim and to say that my accusation was unwarranted. I have since read further on the matter and now conclude that my challengers are right and I was wrong. My apologies to all readers, and to the memory of Joe Rosenthal, who died August 20, 2006.

Ralph Estling
Ilminster
Somerset
United Kingdom

For details on the origins of the misunderstandings about the Iwo Jima flag-raising photo, see Chapter 11, "The Flags," and Chapter 12, "Myths," in James Bradley's excellent, well-researched book, Flags of Our Fathers: Heroes of Iwo Jima. *The book is the basis for the Clint Eastwood film released in October. Bradley's father was one of the men in the famous photo.—Editor*

Erin Brockovich

Perhaps a footnote to the commentary by Elizabeth M. Whelan (May/June 2006) and the subsequent correspondence (September/October 2006) would be of interest and enlightening.

In the movie about Brockovich, there was a scene where she was involved in a serious automobile accident. This was false. There was an accident in Reno in 1991, but the speed was at most two miles per hour and likely less. Brockovich was at fault, but for an unknown reason, the defense insurance carrier settled the case during trial. A defense verdict appeared near certain. I served as an engineering witness for the defense.

A medical doctor had stopped his van to drop off his children at elementary school, where the speed limit was fifteen mph. Brockovich was also stopped for the same reason and was talking to an adult friend through her open driver's-side window. The van was in front of her at ninety degrees to her path, nose to her right. She started forward without sufficient care, moved a few feet, and put a small dent in the extreme-right rear corner of the van fender with the right corner of her front bumper. Absence of scratches proved that the van was not moving and I testified to that in court.

Was this movie crash just a Hollywood embellishment? Would I permit a story of my life to be so distorted? Never, but engineers have a strict code of ethics! It may be interesting to note that her attorney, the same one she worked for in the environmental case, later contacted me to work on another case for him, but it was not in my field. Much is unanswered in this attractive young lady's life.

Lindley Manning
Reno, Nevada

Natural-childbirth Controversy

I am writing regarding your Skeptical Inquiree article ("'Natural' Childbirth," March/April 2006) and the letters to the editor published in a subsequent issue (July/August 2006).

In response to the thoughtful letters sent in reply to his article, Benjamin Radford wrote that he agreed that treating birth as a pathology was a problem. And yet, he himself does this very thing early in his original article. He compares natural childbirth to a diabetic dying from lack of insulin. Birth is a normal physiologic function; diabetes is a disease. A healthy laboring woman choosing to avoid the risks and complications of pain medication is not antiscience and should not be compared to someone suffering from a disease process. If Radford had focused on the decades of scientific literature outlining the risks of using pain medication and other *elective* procedures versus supporting normal, nonpathological birth, he might have actually answered the question posed by L. Capps when he asked what was behind the current move toward the natural-birth process.

Talitha Sherman
Natural Childbirth Educator,
Labor Doula
Gardena, California

Benjamin Radford responds:

Sherman misread my piece. Nowhere in my column did I compare natural childbirth to a diabetic dying from lack of insulin. I was quoting Robert Carroll's definition of natural.

The letters column is a forum for views on matters raised in previous issues. **Letters should be no more than 225 words.** Due to the volume of letters not all can be published. Address letters to Letters to the Editor, SKEPTICAL INQUIRER. Send by e-mail text (not as an attachment) to letters@csicop.org (include your name and address). Or mail to 944 Deer Drive NE, Albuquerque, NM 87122, or fax to 505-828-2080.

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